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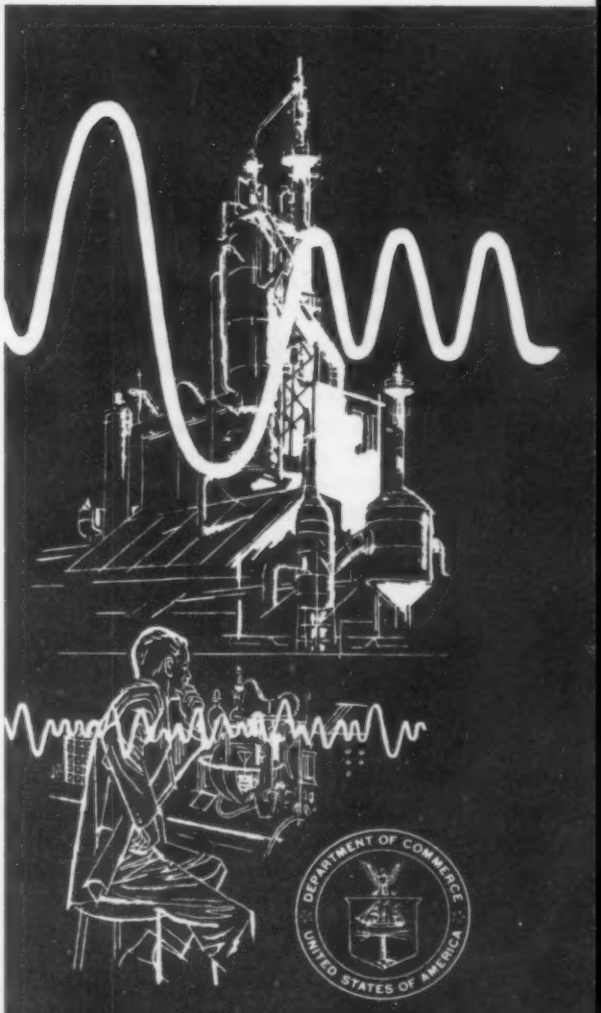

U. S. DEPARTMENT OF COMMERCE
BUSINESS AND DEFENSE SERVICES ADMINISTRATION
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U.S. GOVERNMENT RESEARCH REPORTS

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TECHNICAL ABSTRACT BULLETIN

1. AIRCRAFT AND FLIGHT EQUIPMENT

AD-260 889 Div. 1
(9 Aug 61) OTS price $1.10

Flight Control Lab., Aeronautical Systems Div., Wright-Patterson Air Force Base, Ohio.
SOME ASPECTS OF THE PROBLEM OF DISPLAY INTEGRATION.
Rept. on Flight Control and Flight Display Integration,
by John H. Kearns and Malcolm L. Ritchie.
May 61, 5p. (Proj. 6190; In cooperation with Ritchie and Associates, Inc.)
(ASD TN 61-5) Unclassified report

Based on a paper prepared for the 13th Annual Convention of the International Air Transport Association (IATA), held in Lucerne, Switzerland, on 2-9 May 1960.

DESCRIPTORS: *Instrument panels, *Cockpits, Display systems, Flight instruments, Control, Design, Flight.

Cockpit instrumentation has been treated only recently as a systems design problem. This approach is known as control-display. Naturally, many problems and obstacles to the acquisition of suitable techniques and knowledge exist. Some select aspects of a philosophy of the approach are discussed. (Author)

AD-261 012 Div. 1
(10 Aug 61) OTS price $1.60

Aeronautical Instruments Lab., Naval Air Development Center, Johnsville, Pa.
INVESTIGATION AND EVALUATION OF HYDRAULIC PRESSURE SNUBBERS,
by H. Leslie. 13 Mar 61, 4p. illus. (Rept. no. NADC-AI-6077)
(Proj. TED no. ADC AV-43032)
Unclassified report

DESCRIPTORS: Aircraft equipment, Tests, *Hydraulic systems, Oscillation, Damping, Pressure gages, Transducers, *Pressure regulators, *Naval aircraft, Pressure, Control.

The purpose of this investigation was to evaluate high pressure hydraulic pressure snubbers for Naval aircraft use and to prepare a specification and standard for their competitive procurement. The snubbers are devices which can be installed in fluid pressure lines for the purpose of preventing pressure surges, pulsations and oscillations in these lines from reaching the pressure sensor of an instrument where they can cause erratic operation or damage to pressure gages, transducers, and switches and produce gage pointer oscillation. Of the 7 snubbers tested, only one provided effective control of severe pressure variations in a gage line at room temperature, low temperature, and high temperature. This snubber was also satisfactory as to dimensions, weight, configuration, ease of disassembly, and method installation. Furthermore, it could not be adjusted externally. (Author)

AD-261 035 Div. 1, 19
(10 Aug 61) OTS price $3.60

Flight and Engineering Test Group, Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
T-37B CATEGORY II ADVERSE WEATHER FLIGHT TESTS.
Rept. for Oct 60-Feb 61,
by James R. Moore. May 61, 25p. incl. illus. table.
(Proj. 4241(4))
(WADD TN 61-47) Unclassified report

DESCRIPTORS: *Jet training planes, Jet planes, Flight testing, *All weather aviation, Ice, Instrument flight, Cockpits, Visibility, Ice prevention, Electronic equipment, Control systems, Take-off, *Radar navigation, Turbulence, Instrument landings, Control, Radio communication systems, Radio equipment, Navigation computers, Ground controlled approach radar, Storms.

The all-weather capabilities of the T-37B aircraft were investigated, and techniques and procedures were established for flight under instrument conditions. In general, characteristics of the aircraft, under instrument-flying and night-flying were satisfactory. Flights in artificial icing conditions (behind a KC-135 spraying water) resulted in the elevator freezing to the horizontal stabilizer and engine flameouts. The lack of anti-icing resulted in the recommendation that the T-37B not be flown under icing or forecasted icing conditions. Aircraft and equipment deficiencies found during this test program did not prevent the aircraft from performing its designed mission as VFR (Visual Flight Rules) trainer. (Author)

AD-261 051 Div. 1
(8 Aug 61) OTS price $10.50

Fram Corp., Providence, R. I.
FABRICATION AND FIELD EVALUATION OF A HIGH-CAPACITY, HIGH-EFFICIENCY CHARGE-AIR FILTER SYSTEM FOR ARMY AIRCRAFT. PHASE I. DESIGN, FABRICATION AND INITIAL EVALUATION.
Final rept. on Phase 1,
by B. S. McCarroll and J. W. Jackel. May 61, 129p. incl. illus. tables.
(Contract DA 44-177-tc-495, Proj. 9R38-01-017-45)
(TREC TR 61-57) Unclassified report

DESCRIPTORS: *Air intake filters, Design, Tests, *Helicopters, Liaison planes, Military aircraft, *Airplane engines, Manufacturing methods, Carbureters, Cooling.

Division 1- AIRCRAFT AND FLIGHT EQUIPMENT

The design and prototype field evaluation of a new high capacity, high efficiency air filtration system for use on light fixed and rotary wing aircraft is described. This work was the outgrowth of the original development of an optimum filter medium to protect the air induction system of aircraft from the ingestion of large amounts of dust and other air-borne contaminants. Preliminary laboratory testing and a field test of the new engine air filtration system were carried out using an Army H-23 helicopter as a test vehicle. The field test program culminated with the certification of the air filter unit by the Federal Aviation Agency. Results of both laboratory and field testing are reported in detail. (Author)

AD-261 118 Div. 1
(14 Aug 61) OTS price $5.60

Pitman-Dunn Labs., Group, Frankford Arsenal, Philadelphia, Pa.
DEVELOPMENT AND QUALIFICATION OF THRUSTER, CARTRIDGE ACTUATED, T33, FOR JETTISONING OF THE T38 AIRCRAFT CANOPY.
Rept. for Oct 57-Apr 60,
by C. J. Litz, Jr., and A. E. White. May 61, 58p. incl. illus. tables (FA rept. no. R-1587)
(WADD TR 61-61) Unclassified report

DESCRIPTORS: *Jet training planes, Jet planes, *Jettisonable cockpits, *Explosive actuators, Tests, Design, Ignition, Safety devices.

Frankford Arsenal was requested to develop an M5-type thruster to jettison the canopies of the Northrop Aircraft, Inc. version of the T38 jet trainer aircraft. A satisfactory thruster using a new cartridge was designed. The thruster is the same as the M5A2 thruster except that the new thruster has a two-piece cartridge retainer instead of a one-piece cartridge retainer. The cartridge charge is larger than that in the M38 cartridge used in the M5A2 thruster. In tests, the new thruster met all military requirements and was subsequently standardized. (Author)

AD-261 195 Div. 1
(14 Aug 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
PRELIMINARY BASE PRESSURES OBTAINED FROM THE X-15 AIRPLANE AT MACH NUMBERS FROM 1.1 TO 3.2,
by Edwin J. Saltzman. Aug 61, 28p. incl. illus. tables, 8 refs. (NASA Technical note no. D-1056)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1056.

DESCRIPTORS: *Research planes, *Supersonics, *Hypervelocity vehicles, Fuselages, Pressure, Aerodynamics, Tests, Flight testing, Fins, Drag, Rocket motors, Superaerodynamics, *Parasite planes, *Rocket planes.

Base pressure measurements were made on the fuselage, 10 degree-wedge vertical fin, and side fairing of the X-15 airplane. Data are presented for Mach numbers between 1.1 and 3.2 for both powered and unpowered flight. Comparisons are made with data from small-scale-model tests, semiempirical estimates, and theory. The results of this preliminary study show that operation of the interim rocket engines reduces the base drag of the X-15 by 25 to 35% throughout the test Mach number range. Values of base drag coefficient for the side fairing and fuselage obtained from X-15 wind-tunnel models were adequate for predicting the over-all full-scale performance of the test airplane. The leading-edge sweep of the upper movable vertical fin was not an important factor affecting the fin base pressure. The power-off base pressure coefficients of the upper movable vertical fin are in general agreement with the small-scale blunt-trailing-edge-wing data of several investigators and with two-dimensional theory. (Author)

AD-261 375 Div. 1
(16 Aug 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
SOUND PRESSURES AND CORRELATION OF NOISE ON THE FUSELAGE OF A JET AIRCRAFT IN FLIGHT,
by Russell D. Shattuck. Aug 61, 32p. incl. illus. tables (NASA technical note no. D-1086)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1086.

DESCRIPTORS: *Jet plane noise, Fuselages, Pressure, Flight testing, Boundary layer, *Jet engine noise, Flight, Velocity, Jet bombers, Acoustics, Microphones, Sound, Jet planes, Measurement.

Tests were conducted at altitudes of 10,000, 20,000, and 30,000 feet at speeds of Mach 0.4, 0.6, and 0.8. It was found that the sound pressure levels on the aft fuselage of a jet aircraft in flight can be estimated using an equation involving the true airspeed and the free air density. The cross-correlation coefficient over a spacing of 2.5 feet was generalized with Strouhal number. The spectrum of the noise in flight is comparatively flat up to 10,000 cycles per second. (Author)

AD-261 429 Div. 1, 19
(17 Aug 61) OTS price $1.10

Pneumodynamics Corp., Grand Rapids, Mich.
STANDBY, TWO-INCH DIRECTIONAL INDICATOR.
Interim rept. no. 9, 1-31 Mar 61.
13 Apr 61, 7p. incl. illus.
(Contract NOw 60-0626-c)
Unclassified report

DESCRIPTORS: *Compasses, *Gyroscopes, Flight instruments, Design, Tests, Display systems, Servo systems, Navigation.

Research was continued on the development of a standby 2-inch directional indicator and compass system. Design and detailing on the two major mechanical elements of the system have been completed and redesign of some elements which have not performed satisfactorily in design acceptance tests on the gyro and indicator servomechanism is essentially complete. The first gyro assembly has been run through further design sampling tests. The results indicate very satisfactory performance. The indicator servo and display system is complete and will be tested as part of the integrated compass system when the compass controller is complete. The compass controller design is complete and assembly of the first unit is in process. (Author)

AD-261 430 Div. 1, 19
(17 Aug 61) OTS price $1.60

Pneumodynamics Corp., Grand Rapids, Mich.
STANDBY, TWO-INCH DIRECTIONAL INDICATOR.
Interim rept. no. 8, 1-28 Feb 61.
6 Mar 61, 10p. incl. illus.
(Contract NOw 60-0626-c)

Unclassified report

DESCRIPTORS: *Compasses, *Gyroscopes, Flight instruments, Design, Tests, Display systems, Servo systems, Navigation.

Research was continued on the development of a standby 2-inch directional indicator and compass system. Assembly of the first two major mechanical elements of the system have been essentially completed. The assembly of the first gyro unit has been completed and initial tests indicate very satisfactory performance. The first indicator servo and display mechanism have been assembled and all interferences and design errors are being corrected to obtain an optimum functioning unit. The servo amplifier design is 100% complete. Full dynamic, hot and cold tests have been run on the breadboard version with end use components. This amplifier will meet all design specifications and is being packaged as a module. (Author)

AD-261 431 Div. 1, 19
(17 Aug 61) OTS price $1.60

Pneumodynamics Corp., Grand Rapids, Mich.
STANDBY, TWO-INCH DIRECTIONAL INDICATOR AND COMPASS SYSTEM.
Interim rept. no. 7, 1-30 Jan 61.
6 Feb 61, 14p. incl. illus.
(Contract NOw 60-0626-c)

Unclassified report

DESCRIPTORS: *Compasses, *Gyroscopes, Design, Tests, *Flight instruments, Display systems, Servo systems, Navigation.

Research was continued on the development of a standby 2-inch directional indicator and compass system. Design and detailing on the two major mechanical elements of the system have been essentially completed. The assembly of the gyro rotor and rotor housing has been completed and initial tests indicate very satisfactory performance. The indicator servo and display mechanism design is completed. (Author)

AD-261 432 Div. 1, 19
(17 Aug 61) OTS price $1.60

Pneumodynamics Corp., Grand Rapids, Mich.
STANDBY, TWO-INCH DIRECTIONAL INDICATOR AND COMPASS SYSTEM.
Interim rept. no. 6, 20 Nov-Dec 60.
10 Jan 61, 14p. incl. illus.
(Contract NOw 60-0626-c)

Unclassified report

DESCRIPTORS: *Compasses, *Gyroscopes, *Flight instruments, Design, Materials, Manufacturing methods, Servo systems, Display systems.

Progress is reported on the development of a two-inch, directional indicator and compass system. The discussion includes: (1) fabrication of the gyro section; (2) the means of fastening copper support wire to the vibration bar used in the vibration oscillator-amplifier which is a part of the compass system controller; and (3) the selection of several components of the servo system. The design layout of the complete servo system is also presented.

AD-261 433 Div. 1, 19
(17 Aug 61) OTS price $1.60

Pneumodynamics Corp., Grand Rapids, Mich.
STANDBY, TWO-INCH DIRECTIONAL INDICATOR AND COMPASS SYSTEM.
Interim rept. no. 5, 20 Oct-19 Nov 60.
23 Nov 60, 9p. incl. illus.
(Contract NOw 60-0626-c)

Unclassified report

DESCRIPTORS: *Compasses, *Gyroscopes, *Flight instruments, Design, Tests, Display systems, Servomechanisms, Servo systems.

Work continued on the development of a miniaturized two-inch directional indicator and compass system incorporating automatic magnetic slaving, directional gyro stabilization and automatic synchronization, and latitude compensation. The design of the basic gyro element has been completed and is included. The compass control circuitry has been breadboarded and tested with good results. The design of the display and servo drive portion of the indicator is approximately 75% complete and is shown. (Author)

AD-261 434 Div. 1, 19
(17 Aug 61) OTS price $3.60

Pneumodynamics Corp., Grand Rapids, Mich.
STANDBY, TWO-INCH DIRECTIONAL INDICATOR AND COMPASS SYSTEM.
Interim rept. no. 4, 20 Sep-19 Oct 60.
19 Oct 60, 33p. incl. illus.
(Contract NOw 60-0626-c)

Unclassified report

DESCRIPTORS: *Compasses, *Gyroscopes, *Flight instruments, Design, Electric motors, Servomechanisms, Servo systems, Centrifugal compressors, Tests, Materials, Display systems.

Work has continued on a two-inch directional indicator and compass system incorporating automatic magnetic slaving, directional gyro stabilization and automatic synchronization, and latitude compensation. Further tests on the centrifugal have shown that adequate gas pressure can be developed to produce a torque great enough to provide leveling rate of at least one degree per minute, four gas jets being utilized to level the rotor housing. Two test rotor assemblies have been fabricated and tested. It has been elected to proceed with a servo drive system for the compass dial display. The control transformer, differential and motor which will be used are shown. The fast synchronization, slow slaving and latitude compensation system which consists of an amplifier, a torque motor, an electrically operated escapement mechanism, and a beat frequency oscillator system to geneate required timing pulses is discussed.

AD-261 435 Div. 1, 19
(17 Aug 61) OTS price $2.60

Pneumodynamics Corp., Grand Rapids, Mich.
STANDBY, TWO-INCH DIRECTIONAL INDICATOR AND COMPASS SYSTEM.

Interim rept. no. 3, 20 Aug-19 Sep 60.
19 Sep 60, 22p. incl. illus. tables.
(Contract NOw 60-0626-c)

Unclassified report

DESCRIPTORS: *Compasses, *Gyroscopes, Design, *Flight instruments, Centrifugal compressors.

Progress is reported in the development of a two-inch directional indicator and compass system incorporating automatic magnetic slaving, directional gyro stabilization with automatic synchronization, and latitude compensation. Preliminary tests indicate that a centrifugal blower configuration can provide sufficient pressure to properly level the gyro rotor housing. The design of a test gyro rotor and stator is presented. (Author)

AD-261 436 Div. 1, 19
(17 Aug 61) OTS price $1.10

Pneumodynamics Corp., Grand Rapids, Mich.
STANDBY, TWO-INCH DIRECTIONAL INDICATOR AND COMPASS SYSTEM.
Interim rept. no. 2, 20 July-19 Aug 60.
21 Aug 60, 4p.
(Contract NOw 60-0626-c)

Unclassified report

DESCRIPTORS: *Compasses, *Gyroscopes, Tests, *Flight instruments, Design, Bearings.

Progress is reported on the development of a two-inch, directional indicator and compass system incorporating automatic magnetic slaving, directional gyro stabilization with automatic synchronization, and latitude compensation. (Author)

AD-261 437 Div. 1, 19
(17 Aug 61) OTS price $1.10

Pneumodynamics Corp., Grand Rapids, Mich.
STANDBY, TWO-INCH, DIRECTIONAL INDICATOR AND COMPASS SYSTEM.
Interim rept. no. 1, 20 June-19 July 60.
21 July 60, 4p.
(Contract NOw 60-0626-c)

Unclassified report

DESCRIPTORS: *Compasses, *Gyroscopes, Design, Materials, Electric motors, Bearings, *Flight instruments, Navigation.

The purpose of this research is to design, develop, fabricate, assemble, test, and to furnish five flyable developmental models and appropriate engineering data for a standby, two-inch, directional indicator and compass system incorporating automatic magnetic slaving, directional gyro stabilization with automatic synchronization, and latitude compensation. Some of the requirements of the gyro and compass system are discussed. (Author)

AD-261 484 Div. 1, 18
(18 Aug 61) OTS price $3.60

Operations Research Office, Johns Hopkins U., Bethesda, Md.
EFFECT OF DIMENSIONAL VARIATIONS IN TRANSPORT AIRCRAFT CARGO COMPARTMENTS ON SORTIE REQUIREMENTS AND SPACE UTILIZATION IN DEPLOYMENT OF ARMY UNITS,
by Mary J. O'Brien and Carl R. Borchers. Jan 61, 33p. tables (Technical paper ORO-TP-24)

Unclassified report

DESCRIPTORS: *Transport planes, Logistics, Loading, Military requirements, Effectiveness, Air transportation, Military transportation, Cargo.

2. ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

AD-260 815 Div. 2, 9
(9 Aug 61) OTS price $3.60

Wave Research Lab., U. of Calif., Berkeley.
WAVE EXTINCTION BY PNEUMATIC BREADWATER,
by A. A. Dmitriev, T. V. Bonchkovskaya, and A. V. Teplov, tr. by Hildegard Arnesen. Apr 61, 31p. incl. illus. (Series no. 104, Issue 10)
(Contract Nonr-22246, Proj. N 069-198)

Unclassified report

DESCRIPTORS: *Ocean waves, *Water waves, *Breakwaters, Harbors, Air, Bubbles, Pneumatic systems, Turbulence, Theory, Attenuation, USSR, Test facilities, Mathematical analysis.

Pneumatic wave extinguishers for the protection of port constructions are discussed. For better utilization of the wave extinguishers it is necessary to establish the mechanism of the wave extinction process by air-bubbles. The basic causes of extinction are: (1) wave extinction by the speed (velocity) field superimposed on it, created by the motion of the bubbles; (2) reflection of the wave from the curtain of bubbles; and (3) loss of energy on shrinkage and expansion of the rising bubbles of air while passing the crest and trough of the wave above them. The present study was primarily the examination of wave extinction due to circulation currents and turbulence.

AD-260 907 Div. 2
(9 Aug 61) OTS price $3.60

New York U. Coll. of Engineering, N. Y.
LOCAL WIND CIRCULATIONS.
Quarterly progress rept. no. 3, 1 Jan-31 Mar 61, on Some Observational Details of the Sea Breeze in the New York City Area,
by John A. Frizzola. 31 Mar 61, 31p. incl. illus.
(Contract DA 36-039-sc-84939, Proj. 3A99-07-001-03)

Unclassified report

DESCRIPTORS: *Sea breeze, Wind, Meteorological data, New York, Gas flow, Fluid mechanics, Diurnal variations.

The finer structural details of the sea breeze are discussed from observations taken in New York City of the upper wind field on three days in June, 1960. Features such as the frontal characteristics, effects of superposed flow, increase in the low level winds at sunset near the coastline, and rotation of the wind direction with time are discussed. Opposing gradient flows are seen to generate a frontal type sea breeze. The strength and direction of the gradient flow

are important in determining the horizontal and vertical extent of the sea breeze. Abrupt increases in the wind speed in the very lowest layers are noticed on one day at sunset near the coastline. The clockwise rotation with time of the wind towards a direction more parallel to the coastline is seen to be in good agreement with past theory and observations. (Author)

AD-260 928 Div. 2, 6
(8 Aug 61) OTS price $7.60

Smyth Research Associates, San Diego, Calif.
MICRO-METEOROLOGICAL MEASUREMENTS BY MEANS OF SOUND.
Final rept. 4 May 59-31 July 60,
by J. H. Gibbs. 31 July 60, 76p. incl. illus.
(Rept. no. SRA-154)
(Contract DA 36-039-sc-80247)
Unclassified report

DESCRIPTORS: *Micrometeorology, Atmosphere, Turbulence, Measurement, Acoustic horns, Jet engine noise, Jet planes, *Sound transmission, Sound, Propagation, *Acoustic detectors, Test methods.

This study deals with the investigation of the scale and spectra of the turbulent fluctuations over an extended range in the lower atmosphere by means of sound propagation measurements. The measurements were carried out using single-engine, low-flying jet aircraft as the source of sound and the reception at the ground was accomplished by acoustical transducers in horns which were pointed vertically. The analysis of the data was performed by studying several discrete frequencies in the range from 500 to 2000 cycles per sec. It is concluded that sound propagation measurements are a feasible means of evaluating atmospheric turbulence characteristics. (Author)

AD-260 961 Div. 2, 25
(10 Aug 61) OTS price $1.60

Yerkes Observatory, Williams Bay, Wis.
WAVELENGTHS OF THE MEINEL OH BANDS,
by Jeremiah P. Ostriker. 12 June 61, 16p. incl. tables (Scientific rept. no. 35)
(Contract AF 19(604)3044)
(AFCRL-666) Unclassified report

DESCRIPTORS: *Hydroxides, *Night sky, *Molecular spectroscopy, Molecular rotation, Spectrographic data, Vibration, Energy, Upper atmosphere, Determination, Sky brightness.

Wavelengths of the P1, P2, R1, and R2 lines of the Meinel (vibration-rotation) bands of OH were calculated for bands involving v' = 7, 8, and 9. The derived wavelengths are compared with airglow observations. (Author)

AD-260 974 Div. 2
(10 Aug 61) OTS price $1.60

Weather Forecasting Research Center U. of Chicago, Ill.
ON THE VERTICAL CIRCULATION PRODUCED BY RELEASE OF LATENT HEAT IN A STATIC AND QUASI-GEOSTROPHIC ATMOSPHERE,
by Kaare Pedersen. June 61, 12p. incl. illus. table (Scientific rept. no. 5)
(Contract AF 19(604)7230)
(AFCRL 808) Unclassified report

DESCRIPTORS: *Atmosphere, *Convection, Heat transfer, Velocity, Mathematical analysis, Differential equations, *Lapse rate, Condensation, Weather forecasting.

The hydrostatic and the quasi-geostrophic approximations are used to obtain a diagnostic equation for the vertical velocity, the resulting equation being linear. The velocity is divided into two parts, the first corresponding to dry-adiabatic processes, and the second part representing the additional motion that can be ascribed release of latent heat. The differential equation which describes this additional motion is hyperbolic within the region corresponding to a conditionally stable atmosphere. By assuming that the horizontal scale of the area that experiences condensation is independent of pressure, the differential equation reduces to a one-dimensional one, and its solution is obtained by relaxation even in the hyperbolic region. The vertical velocity is obtained also by an iterative procedure, leading to a converging infinite series in which each term is determined from an elliptic differential equation, and the two methods are found to yield the same results. The vertical velocity produced by release of latent heat is found to vary strongly with the state of the air and with the horizontal scale within which condensation takes place. It is found that the saturated-adiabatic process may amplify the large-scale upward motions by as much as an order of magnitude. (Author)

AD-260 975 Div. 2
(10 Aug 61) OTS price $8.10

Weather Forecasting Research Center, U. of Chicago, Ill.
HEAT EXCHANGE AND CYCLONE DEVELOPMENT ON THE NORTH ATLANTIC OCEAN,
by Sverre Petterssen, Dorothy L. Bradbury, and Kaare Pedersen. June 61, 76p. incl. illus. tables, 26 refs. (Scientific rept. no. 4)
(Contract AF 19(604)7230)
(AFCRL 807) Unclassified report

DESCRIPTORS: *Weather forecasting, *Heat transfer, Moisture, Atlantic Ocean, Atmosphere, *Air mass analysis, Cyclones, Probability, Statistical analysis, Meteorological data, Meteorological charts, Atmosphere models.

A general survey is made of the relation between the exchanges of heat and moisture at the ocean-atmosphere interface on the one side, and the development of extratropical cyclones on the other. The methods of computing eddy and other exchanges are described. With the aid of a system of coordinates in which grid points identify distance from the frontal zone and from the cyclone center, cyclone models are constructed as mean states each representing a large number of individual cases. The stages of cyclone development represented by the models are: the nascent cyclone wave, the warm-sector cyclone, the partly occluded cyclone, the fully occluded cyclone, and the cold-core frontless cyclone. The vorticity equation and the thermodynamic energy equation are used to obtain a diagnostic equation for the vertical velocity and a prognostic equation for the rate of change of the thickness of an isobaric layer, both containing

the terms which represent the sensible heat and the release of latent heat. The equations were tested on 10 synoptic situations on the North Atlantic Ocean. (Author)

AD-261 014 Div. 2, 25
(10 Aug 61) OTS price $5.60

Naval Research Lab., Washington, D. C.
NAVAL RESEARCH LABORATORY PAPERS PRESENTED AT THE TENTH INTERNATIONAL ASTROPHYSICAL SYMPOSIUM LIEGE, BELGIUM - JULY 11-15, 1960.
21 July 61, 57p. incl. illus. tables (NRL rept. no. 5608)
Unclassified report

DESCRIPTORS: *Astrophysics, *Spectrographic analysis, X-rays, Ultraviolet radiation, Solar spectrum, Astronomy, Solar flares, Solar disturbances, *Symposia.

Contents:
X-ray and ultraviolet measurements during the eclipse of Oct. 12, 1958; II. X-ray solar disk photograph
Lyman-alpha radiation in the night sky
Ultraviolet light from celestial sources
X-ray emission accompanying solar flares
Observational results on the far ultraviolet radiation of the sun, including X-rays
The profile of solar Lyman-alpha
The extreme ultraviolet spectrum of the sun
Photography of the sun in Lyman-alpha and other wavelengths

AD-261 089 Div. 2, 25, 9
(11 Aug 61) OTS price $5.60

Enrico Fermi Inst. for Nuclear Studies, U. of Chicago, Ill.
THE STELLAR WIND REGIONS,
by E. N. Parker. Nov 60, 49p. illus. 44 refs.
(Contract AF 18(600)666)
(AFOSR-403)
Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, *Sun, *Stars, Solar corona, Solar atmosphere, Wind, Hydrodynamics, Cavitation, Cosmic rays, Supersonic flow, Subsonic flow, Gas flow, Shock waves, Mathematical analysis, Zodiacal light, Temperature, Velocity, Interstellar matter, Solar flares, Ions, Blast, Magnetic storms.

From the observations of the solar wind and of the M-giant alpha-Herculis the gross dynamical features of the stellar wind regions associated with class G main sequence and M-giant stars are given for various interstellar environments. The supersonic wind from a class G star undergoes a shock transition to subsonic flow at a radial distance of 100 - 1,000 a.u. and may extend many times farther as a subsonic flow. This subsonic flow will be subject to turbulence and other instabilities in many cases. The wind from an M-giant may extend many parsecs if the M-giant phase of evolution lasts long enough for its wind to approach equilibrium; the resultant interstellar contamination and heating is important for a distance of many parsecs. A rough calculation of the cavity formed by a stellar wind in a large-scale interstellar field is carried out, and it is found that the cavity shape and dimensions for stationary flow depend upon the back pressure at infinity. As the pressure increases, the cavity changes from a circular cylinder of infinite radius, through an increasingly bulbous shape of finite radius, to a sphere of infinite radius with one finite cylindrical channel from each pole. (Author)

AD-261 101 Div. 2, 25, 9
(11 Aug 61) OTS price $.50

National Aeronautics and Space Administration, Wahington, D. C.
AERODYNAMIC EFFECTS OF METEORITES. A SPECIFIC CASE (Ob odnom effekte v oblasti aerodinamiki meteorov),
by K. P. Stanyukovich. Aug 61, 12p. (NASA Technical trans. F-70 from Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye, no. 5, 1960, pp.3-8)
Unclassified report

Also available for NASA, Wash. 25, D. C., as NASA Technical trans. F-70.

DESCRIPTORS: Astronomy, *Meteors, *Re-entry aerodynamics, Particles, Molecules, Atmosphere, *Secondary emission, Lattices, *Re-entry vehicles, *Ablation.

Presented is a study of atmosphere molecule collisions on a meteor body. For velocity impacts, the magnitude ex is found to be greater than theory predicts. For the given deceleration, the density of the atmosphere is thought to be several times lower than previously calculated by means of meteor data. (Author)

AD-261 108 Div. 2
(11 Aug 61) OTS price $3.60

Naval Air Station, Norfolk, Va.
THE DAYLIGHTER.
Sep 60, 39p. incl. illus. (Rept. no. NWRF-00-0960-037)
Unclassified report

DESCRIPTORS: *Night sky, *Twilight, Diurnal variations, Sun, Motion, *Maps, Northern hemisphere, Southern hemisphere, Earth, Illumination, *Nomographs.

The daylighter is a device which can conveniently illustrate the duration of daylight, twilight, and darkness, particularly in moderately high latitudes. The simpler situations at low latitudes are familiar, as is the annual cycle exactly at the poles. For normal use, the daylighter is set up by placing an overlay map, Northern or Southern Hemisphere, so that it will pivot about the pole over a daylight pattern selected for the appropriate hemisphere and for the date. Daylight patterns are prepared for a number of values of declination of the sun. Except for the soltice patterns, the sun reaches each declination on two dates of each year, once as it passes northward and once as it passes southward.

AD-261 156 Div. 2
(14 Aug 61) OTS price $2.60

Chicago, Ill.
PRECIPITATION IN THE 1960 FLAGSTAFF MESOMETEOROLOGICAL NETWORK,
by Kenneth A. Styber. July 61, 27p. incl. illus. tables (Scientific rept. no. 2)
(Contract AF 19(604)7259)
(AFCRL-694)
Unclassified report

DESCRIPTORS: *Meteorology, Weather forecasting, *Precipitation, Measurement, Hail, Recording devices, *Meteorological instruments, Meteorological charts, Arizona, Wind, Fog, Storms.

During the summer of 1960, a mesometeorological network was established in a 30 x 40 mile area around San Francisco Mountain near Flagstaff, Arizona. Precipitation measurements were made using 165 small, transparent plastic cups and 165 aluminum-foil hail indicators. Instrument spacing of from one to four miles over most of the network proved satisfactory. Both the rain gauge and hail indicator provided reliable measurements. The small-cup rain gauges were somewhat more effective in recording rain from a trace through 0.5 or 0.6 inches than standard gauges. Analysis showed that the isohyets of maximum rainfall were elongated in the general direction of the 700 to 500-mb winds. Practically all of the heavy rain storms were accompanied by hail. At least two of the hail areas were observed to be of an elliptical configuration, and at least two were responsible for locally heavy fogs. Coincidence of the axes of maximum daily precipitation and the axes of maximum total precipitation lead one to suspect the existence of preferred storm tracks. (Author)

AD-261 159 Div. 2, 25
(14 Aug 61) OTS price $11.00

Denver Research Inst., Colo.
BALLOON FLIGHT OF MARCH 2, 1961,
by David G. Murcray, James N. Brooks and Norman J. Sible. 8 May 61, 147p. incl. illus. (Flight data rept. no. 1)
(Contract AF 33(616)7633)
Unclassified report

DESCRIPTORS: Scientific research, Balloons, *Infrared radiation, Measurement, Experimental data, *Geophysics, *Earth, Lead compounds, Selenides, Radiometers, Instrumentation, Calibration, Data processing systems, Automatic, Programming.

The results obtained on a balloon flight made with an automatic programmed radiometer system are presented. The radiometer was equipped with a liquid nitrogen cooled PbSe cell as a detector and measurements were made of the infrared background radiation from 1.8 to 5.0 microns. (Author)

AD-261 183 Div. 2, 25, 12
(14 Aug 61) OTS price $10.50

Lockheed Aircraft Corp., Sunnyvale, Calif.
ARTIFICIAL INJECTION OF ELECTRONS INTO THE GEOMAGNETIC FIELD,
by David D. Elliott. May 61, 131p. incl. illus. tables, 29 refs. (Rept. no. 2-44-61-1)
(Contract AF 29(601)2453, Proj. 4988)
(ARPA Order no. 6-61, Task 5)
(AFSWC TR 61-38) Unclassified report

DESCRIPTORS: *Terrestrial magnetism, Electrons, *Magnetohydrodynamics, Astrophysics, Magnetic fields, Van Allen radiation belt, Injection, Exosphere, *Satellite vehicles, Solar atmosphere, Solar disturbances, *Electron accelerators, Aurorae, Density, Electron capture, Drift, Magnetic effects, Magnetic storms.

Study revealed that a satellite will require a payload capability of about 1000 pounds in order to carry an electron accelerator with the desired characteristics. Two different types of accelerators are required, each for specific experiments. There are commercial accelerators which would be suitable for the injection experiments. One is a 1-mev pulsed accelerator, 100 amps for 4 x 10 to the -6 power sec with a repetition rate of about one per second. The other is a 1-mev d-c accelerator with an output current of 10 to the -3 power amps. The electron injection and trapping will not be seriously affected by either satellite charging or the diamagnetic field of the injected electrons. At altitudes greater than about four earth radii, magnetic shells can be filled with trapped electrons, and their trapping lifetime can be subsequently measured. The bounce time of trapped electrons can be measured to an accuracy of better than 1%. The geographic position of magnetic conjugate points can be measured, but the accuracy of the measurements is dependent on the type of radar system employed in the experiment. (Author)

AD-261 184 Div. 2, 24
(14 Aug 61) OTS price $4.60

Photogrammetry Lab., Mass. Inst. of Tech., Cambridge.
ANALYTICAL AERIAL TRIANGULATION ERROR ANALYSIS AND APPLICATION OF COMPENSATING EQUATIONS TO THE GENERAL BLOCK TRIANGULATION AND ADJUSTMENT PROGRAM.
Interim technical rept. 10 Mar-10 Apr 61 on Phase 1,
by Charles L. Miller and E. Phillip Gladding.
10 Apr 61, 38p. 35 refs.
(Contract DA 44-009-eng-4420, Proj. 8-35-11-520)
Unclassified report

DESCRIPTORS: *Aerial photography, *Mapping, Photographic intelligence, Errors, Atmospheric refraction, Distortion, Photographic lenses, Photographic film, Analysis, Digital computers, Statistical analysis, Least squares method, Position finding.

The results are given of an evaluation study of pertinent and significant information relative to errors, systematic and random, their source, effect, and treatment for the general problem of block analytical photogrammetric aerial triangulation. The particular error sources reviewed are lens distortion, camera parameters, resolution, atmospheric refraction, and film distortion. A discussion of error sources and their treatment, as applicable to the analytical photogrammetric problem, is included. The facility for weighting in the IBM 704 General Block Triangulation and Adjustment Program as supplied by the Government is described. The nature of the weighting routines to be added are described. The converted IBM 709 program is discussed. The salient characteristics, particularly as they differ from the 704 program, and the results of test runs are presented. Recommendations as to the directions of future activity in each of the above areas is given. (Author)

AD-261 191 Div. 2, 16
(14 Aug 61) OTS price $5.60

Armed Forces-NRC Committee on Bio-Astronautics, Washington, D. C.
ORGANIC MATTER AND THE MOON,
by Carl Sagan, 1961, 49p. incl. tables, 89 refs.
(Publication no. 757)
Unclassified report

DESCRIPTORS: *Moon, Organic compounds, Ecology, *Lunar probes, Molecules, Synthesis, Ultraviolet radiation, Contamination, Temperature.

The rate of synthesis of organic molecules by solar ultraviolet radiation in the primitive lunar atmosphere is estimated. Reports of gas clouds on the lunar surface are discussed and shown to be probably unreliable. However, the observations of Kozyrev, if verified, would be evidence for lunar subsurface organic matter. The probability for survival of a terrestrial microorganism, accidentally deposited on the Moon by an impacting lunar probe, is computed. The possible kinds of lunar biological contamination are discussed. The explosive reproduction of only a very small number of terrestrial microorganisms in indigenous organic matter, and the disruption of the ecologies of hypothetical lunar organisms, are remote but non-negligible possibilities. It is recommended that all lunar probes be thoroughly decontaminated, and that the first soft-landing probes be equipped for chemical analysis and biological plating of subsurface samples. (Author)

AD-261 227 Div. 2, 30
(14 Aug 61) OTS price $2.60

Woods Hole Oceanographic Institution, Mass.
THE CALCULATION OF SPECIFIC VOLUME ANOMALIES AND INTERPOLATION FOR DYNAMIC HEIGHTS WITH THE RECOMP II COMPUTER.
Unpublished manuscript,
by David A. McGill. July 61, 25p. incl. illus. tables (Ref. no. 61-21)
(Contract Nonr-219600, Proj. NR 083-004)
Unclassified report

DESCRIPTORS: *Oceanography, Ocean currents, *Transport properties, *Sea water, *Data processing systems, *Programming, Digital computers, Volume, Density, Oceanographical data, Standards, Tables.

Contents:
A review of the theory for determination of gradient currents and mass transport in sea water
Recomp II computer program for specific volume anomaly
General restrictions
Usage
Comparison of manual and tabular computations of specific volume anomaly with the results of Recomp II
Interpolation and use of specific volume anomaly
Recomp II computer program for interpolation to standard depths and calculation of dynamic heights
General restrictions
Usage
Analysis of the results of dynamic computation by Recomp II
Further use of the dynamic height data

AD-261 381 Div. 2
(16 Aug 61) OTS price $3.60

New York U. Coll. of Engineering, N. Y.
DIABATIC EFFECTS IN A MULTI-LAYER MODEL OF THE LOWER TROPOSPHERE,
by Robert T. Duquet, July 61, 31p. incl. illus. (Scientific rept. no. 3)
(Contract Nonr-28509)
Unclassified report

DESCRIPTORS: *Atmosphere models, Atlantic Ocean, Errors, Numerical methods and procedures, Meteorological charts, Heating, Vortices, *Weather forecasting, Partial differential equations, *Temperature inversion, *Air mass analysis, Heat transfer, Hydrodynamics, Surface temperatures.

The heating of the atmosphere by a warm underlying surface and by latent heat of condensation are included in a multi-layer, quasi-geostrophic model of the atmosphere. Attention is focused on the lower troposphere by means of a vertical coordinate. Such a transformation places all significant levels in the model at and below 500 mb. To simulate conditions in the region above 500 mb a modeling approximation on the vertical velocity profile is employed. The barotropic vorticity equation is used at 500 mb. The amount of heating and its vertical distribution are governed in the model by macro-scale parameters. The changes of the surface air temperature are carried in the computations, and lead to the generation of fronts along the Atlantic coastline. (Author)

AD-261 386 Div. 2, 15, 25
(29 Aug 61) OTS price $1.10

Polytechnic Inst. of Brooklyn, N. Y.
DERIVATION OF WEBER'S POTENTIAL FROM THE EQUATIONS OF A GEODESIC IN A SCHWARZSCHILD FIELD,
by A. L. Harvey. 1 Aug 61, 4p. (Technical rept. no. 3)
(Contract Nonr-83930, Proj. NR-013-106)
Unclassified report

DESCRIPTORS: *Geodesics, Velocity, Mercury, Astronomy, *Celestial mechanics, Potential theory, Electromagnetic fields, Equations, Motion.

Prior to the present day general acceptance of Einstein's general theory of relativity as a reasonable basis for explaining the advance in the perihelion of Mercury there were many attempts to explain this apparent anomaly on the basis of velocity dependent potentials. Prominent among these tried was Weber's electrodynamic potential V is similar to 1/r (1 + v squared/c squared). That such potentials gave better results than the bare Newtonian potential is not fortuitous. In fact, Weber's potential is derivable from the equations of a geodesic in a Schwarzschild field. This is accomplished by reducing the set of equations for the geodesic to one equation in r and interpreting the equation as an expression of Newton's second law, F equals ma. From the terms identified as comprising F, Weber's potential is readily obtained. (Author)

AD-261 411 Div. 2
(17 Aug 61) OTS price $16.50

Stevenson, Robert E., Los Angeles, Calif.
THE SUMMER CLIMATIC ENVIRONMENT OF THE YORKSHIRE COAST, ENGLAND,
by Robert E. Stevenson. 1961, 239p. incl. illus. 242 refs.
(Contract Nonr-267900, Proj. NR 388-052)
Unclassified report

DESCRIPTORS: *Oceanography, Climatic factors, Great Britain, *Meteorological data, Beaches, *Climate, North Sea.

AD-261 417 Div. 2, 8
(16 Aug 61) OTS price $3.60

Research Labs. for the Engineering Sciences, U. of Virginia, Charlottesville.
STUDY OF STELLAR SCINTILLATION.
Quarterly progress rept. no. 4, 15 Mar-15 June 61,
by E. C. Stevenson. July 61, 32p. incl. illus. tables, 11 refs. (Rept. no. EE-4437-104-61U)
(Contract DA 36-039-sc-85150)
Unclassified report

DESCRIPTORS: *Radio astronomy, *Extraterrestrial radio waves, Microwaves, Ionosphere, Drift, Correlation techniques, Microwave spectroscopy, Oscillation, Radio transmission, Velocity, Stars.

The results of analysis of simulated and actual radio star scintillation records leave little doubt of the validity of the correlation method of Briggs, Phillips, and Shinn as extended by Phillips and Spencer when applied to ground intensity patterns. At Charlottesville, Virginia, the axial ratio of elliptical intensity contours is large, averaging 20 to 1, and therefore calculated drift velocities have large errors in both magnitude and direction. The greatly elongated ellipsoidal irregularities in the ionosphere responsible for scintillations are aligned in the direction of the local magnetic field of the earth. The drift had a component to the west of the long axis of the ellipsoid in all cases analyzed. On the average, the random velocity component was less than half the drift velocity. (Author)

AD-261 453 Div. 2, 25
(18 Aug 61) OTS price $3.60

Science and Tech. Section, Air Information Div., Washington, D. C.
PHENOMENA IN THE UPPER ATMOSPHERE. REVIEW OF SOVIET LITERATURE.
Monthly rept. no. 15 for July 61.
31 July 61, 34p. incl. illus. tables (AID rept. 61-110)
Unclassified report

DESCRIPTORS: *Astrophysics, *Geophysics, *Bibliography, Upper atmosphere, Ionosphere, Solar atmosphere, Atmospheric electricity, Terrestrial magnetism, Magnetic storms, USSR, Literature.

Materials are reported which deal with the following topics: (1) Solar radiation and the ionosphere, (2) Telluric currents, and (3) Atmospheric electricity. (Author)

AD-261 485 Div. 2
(18 Aug 61) OTS price $2.60

Oregon State U. School of Science, Corvallis.
SURFACE TEMPERATURE AND SALINITY OBSERVATIONS AT SHORE STATIONS ON THE OREGON COAST,
by Norman Kujala and Bruce Wyatt. June 61, 23p. incl. illus. tables (Data rept. no. 6; Ref. no. 61-4)
(Contract Nonr-128602, Proj. NR 083-102)
Unclassified report

DESCRIPTORS: Surface temperatures, Salinity, *Oceanography, *Oceanographical data, *Oregon.

This report includes the temperature and salinity data collected at nine shore stations along the Oregon coast from the Columbia River south to Bandon, Oregon. The purpose of this study is to obtain basic information and to supplement our monthly offshore oceanographic survey cruises. (Author)

AD-261 494 Div. 2
(18 Aug 61) OTS price $3.60

Utah State U., Logan.
THERMODYNAMICS OF WATER MOVEMENT IN THE SOIL.
Annual rept.,
by Sterling A. Taylor, Jacob Kijne and others.
July 61, 36p. incl. illus. tables.
(Contract DA 36-039-sc-80263)
Unclassified report

DESCRIPTORS: *Soils, Moisture, Heat transfer, Evaporation, *Thermodynamics, *Water, Motion, Experimental data, Meteorological data, Atmosphere, Density, Weather forecasting, *Military operations, *Evapotranspiration, Hydrology, Trafficability, Terrain, Surface properties, Micrometeorology.

This analysis presents the results of research on the influence of variations in soil water content and soil temperature on the movement of heat and water in the soil. Results were summarized under three phases: (1) Compressibility experiments were carried out to evaluate the influence of soil compaction on the water-retaining strength of the soil. It was found that the latter decreased with increases in soil density and temperature for a particular soil when moisture content, mechanical pressure, and all other composition variables were held constant, (2) Evaporation of soil water under isothermal conditions was measured in a series of experiments to determine the dependence of rate of drying of soil on soil temperature. Dry air was passed over moist soil columns and evaporation was measured over a range of temperatures. Experimental results indicate that the rate of water loss is a function of the heat content of the soil water as well as the rate of water movement within the soil, and (3) Thermal gradient experiments were conducted in the laboratory to determine the functional relationship of the rate of heat and moisture transfer to the temperature gradient in the soil. Movement of water, both in liquid and vapor phases, was from the warm to the cool region in the soil. (Author)

3. CHEMICAL WARFARE EQUIPMENT AND MATERIALS

AD-260 872 Div. 3, 16
(8 Aug 61) OTS price $2.60

Institute of Agriculture, U. of Minn., St. Paul.
PATHOGENICITY AND AGGRESSIVENESS OF ENTITIES OF PUCCINIA GRAMINIS TRITICI RACE 15B OBTAINED FROM COLLECTIONS AND HYBRIDIZATION.
Quarterly progress rept. no. 8, 16 Mar-30 June 61,
by Roland F. Line and Wiley N. Garrett.
30 June 61, 27p. incl. tables.
(Contract DA 18-064-404-cml-433, Proj. 4-11-01-004)
Unclassified report

DESCRIPTORS: *Biological warfare agents, *Fungi, *Rusts, Climatic factors, Temperature, Wheat, Agriculture, Infections, Spores, Cereals, Separation, Growth, Storage, Viability, Radiation effects.

Division 4- CHEMISTRY

Contents:
Obtaining and purifying isolates of Puccinia graminis tritici
Selecting and testing P. graminis tritici race 15B isolates for aggressiveness at low incubation temperatures
Selecting isolates at low incubation and development temperatures
Comparing the rate of development of race 56 with race 15B
Field tests for evaluation of infectibility and spread of low temperature selected isolates of race 15B as compared with non-selected isolates of race 15B and race 56
Field tests of infectibility and spread of several different isolates of P. graminis tritici
Effect of light during development of viability of urediospores
The effect of pustule age on urediospore visibility
The effect of host and race on urediospore visibility irradiation of race 15B urediospores
Hybridization and selfing studies of P. graminis tritici

AD-260 926 Div. 3, 14, 26
(8 Aug 61) OTS price $1.60

Stanford Research Inst., Menlo Park, Calif.
ENCAPSULATED AEROSOLS.
Quarterly progress rept. no. 5, 1 Apr-30 June 61, by Robert C. Robbins. 31 July 61, 11p. incl. illus. table.
(Contract DA 18-108-405-cml-746)
Unclassified report

DESCRIPTORS: *Aerosols, Coatings, Chemical warfare agents, Packaging, *Encapsulation, Films, Vapors, Condensation, Liquids, Phosphites, Polymerization, Acrylic resins, Vinyl radicals, Ethylenes, Polymers, Cellulose nitrate, Rubber, Polymer solutions, Acetates, Glycols, Butyl radicals.

Condensation polymerization of a number of vapor phase monomers, as a means of encapsulating aerosol droplets, was studied. The best of these, vinyl acetate, polymerized rapidly and produced some polymer film encapsulation of the aerosol droplets. A two-stage microcapsule generator was designed, fabricated, and operated. Dibutyl phosphite droplets of about 5-micron diameter were encapsulated with a liquid glycerine film. By using solutions of encapsulating material, the generator also produced microcapsules of dibutyl phosphite in polyethylene, nitrocellulose, and natural rubber. (Author)

AD-261 216 Div. 3, 2
(14 Aug 61) OTS price $5.60

Aerosol Lab., Stanford U., Calif.
SURVEY OF ATMOSPHERIC STABILITY CONDITIONS RELATIVE TO DIFFUSION OF AIRBORNE MATERIAL OVER POLAR AREAS AND GLACIER SURFACES,
by David T. Prophet. July 61, 53p. incl. illus. tables, 55 refs. (Technical rept. no. 90)
(Contract DA 42-007-403-cml-448)
Unclassified report

DESCRIPTORS: *Atmosphere, *Aerosols, Airborne, Arctic regions, Transport properties, *Meteorological data, Stability, Temperature, Terrain, Surface properties, Snow, Ice, Permafrost, Glaciers, Heat transfer, *Diffusion.

Meteorological information and data relative to the probable travel behavior of airborne material over Polar and glacier regions are reviewed. The vertical stability is classified into four main types depending upon the structure of the vertical temperature gradient. It is shown that the frequency of occurrence of each stability type varies with the seasons and is primarily a function of radiation balance at the surface, the heat exchange between the surface and the air above, and the temperature at the surface relative to 32 F. During winter, the vertical temperature structure over both Polar Regions is very similar by virtue of the intense radiational cooling at the surface. However in summer, the vertical temperature structure over the Arctic is found to be quite different from that over the Antarctic. The reason for this difference is explained in terms of differences in prevailing surface temperatures and availability of warm air masses. During summer, the stability structure over glacier surfaces is shown to depend upon the temperature of the air traversing the glacier relative to 32 F. The analysis indicates that conditions during summer days over glaciers at the lower elevations in the Northern Hemisphere are not typical of either Polar Region. (Author)

4. CHEMISTRY

AD-260 890 Div. 4
(9 Aug 61) OTS price $1.60

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
STERICAL FACTORS IN UNIMOLECULAR AND BIMOLECULAR REACTIONS (Sterichespie Faktory v Monomolekulyarnykh i Bimolekulyarnykh Reaktsiyakh), by A. D. Stepukhovich and L. M. Timonin, tr. by Theodor Ranov. (1952) 16p. (Trans of Zhurnal Fizicheskoy Khimii (Jnl. of Physical Chemistry) 26:145-155, 1952)
Unclassified report

DESCRIPTORS: *Stereochemistry, *Chemical reactions, *Reaction kinetics, Molecules, Physical chemistry, Quantum mechanics, USSR.

Based on a comparison of the transient state and collision methods, formulas were obtained for the calculation of steric factors in bimolecular and unimolecular reactions. For unimolecular reactions, the calculation of the steric factor by the transient state method requires the knowledge of the activation energy of the reaction; for bimolecular reactions, the calculation of s does not require the knowledge of E. The steric factor for the unimolecular elementary reaction C2H5 gives C2H+H was calculated; for a value of gamma equals 0.15, it equals one. This indicates the possibility of calculating the rate constant of this reaction by the classical theory formula for unimolecular reactions, taking into account all the vibratory degrees of freedom of the molecule. The steric factor for the elementary reaction C2H4+H gives C2H5 was calculated to be approximately equal to 0.001. This value is nearly 10 times smaller than the quantity s sub 2 assumed, without any foundation, for experimental work with bimolecular reactions. (Author)

AD-261 000 Div. 4, 17
(10 Aug 61) OTS price $.75

Ledoux and Co., Inc., Teaneck, N. J.
OXYGEN IN BERYLLIUM.
Rept. for 1 Mar 59-29 Feb 60, on Materials Analysis and Evaluation Techniques,
by Silve Kallmann, Fred Collier and others.
Dec 60, 17p. incl. illus. table, 17 refs.
(Contract AF 33(616)6281, Proj. 7360)
(WADD TR 60-185) Unclassified report

DESCRIPTORS: *Beryllium, Beryllium compounds, Oxides, Oxygen, Chemical analysis, Test methods, Determination.

The inert gas fusion method is shown to be well suited for the determination of the total O in Be metal. In order to release the oxygen from the very refractory beryllium oxide it is necessary to use a medium in which Be metal is soluble. Nickel was found to be the most suitable flux. Among the methods based on differential solubility of Be, the bromine-methanol procedure was found superior. A limitation of the method is caused by the unspecificity of the reagent. (Author)

AD-261 016 Div. 4
(10 Aug 61) OTS price $.50

Naval Research Lab., Washington, D. C.
THE ADSORPTION OF OIL-SOLUBLE SULFONATES AT THE METAL/OIL INTERFACE.
Interim rept.,
by W. D. Bascom and C. R. Singleterry. 14 July 61, 12p. incl. illus. tables, 25 refs. (NRL rept. no. 5623)
Unclassified report

DESCRIPTORS: *Stainless steel, Metal films, Oxides, *Sulfonates, Naphthalenes, Copper compounds, *Thin films, Films, Adsorption, Soap solutions, Organic solvents, Wetting agents, Alkyl radicals, Soaps, Sodium compounds, Ions, Cesium compounds, Ethylenes, Polymers, Oils, Surface properties.

It has been found possible to isolate adsorbed films of the salts of dinonylnaphthalene sulfonic acid on stainless steel surfaces by retraction from aromatic hydrocarbon solution. The wetting behavior of various series of liquids on the resulting film-coated surfaces suggests that the molecules adsorb to give monomolecular films by attachment of the polar sulfonate heads to the metal oxide surface with the hydrocarbon tails outward. The molecules are sufficiently close packed to yield a surface having properties similar to those of polyethylene. A study of the wettability of the soap monolayers by a series of alkylnaphthalene liquid indicates that adsorption from water-saturated solution is independent of the soap cation and is the result of dipole interactions between the hydrated sulfonate ion pair with the metal oxide surface. Adsorption from anhydrous solution does depend upon the choice of cation. Here dipole interactions between the unhydrated ion pair and the metal oxide surface appear to be supplemented by coordination of the cation with the oxygen of the oxide film. (Author)

AD-261 204 Div. 4
(14 Aug 61) OTS price $1.10

Frick Chemical Lab., Princeton U., N. J.
REDOX ANALYSIS OF CRYOGENICALLY STABLE PRODUCTS OF DISSOCIATED WATER VAPOR,
by Henry M. Gladney and David Garvin. 1961, 8p. incl. table.
Unclassified report

DESCRIPTORS: *Water vapor, Dissociation, *Hydrogen compounds, *Oxides, Tetroxides, *Peroxides, Oxidation, Reduction, Chemical reactions, Oxidation-reduction reactions, Electric discharges, Titration, Cryogenics, Low temperature research, Freezing.

A study is reported of the oxidizing and reducing powers of the products that can be frozen at liquid nitrogen temperature from water vapor dissociated by an electrodless discharge. The frozen material exhibits a greater oxidizing and reducing power than does the solution formed after melting of the products. This extra titer does not show a stoichiometric relation to the oxygen evolved upon warming. The ratio of oxidation to reduction equivalents is about 1:2. It is suggested that the unstable species is either H2O3 or H2O4. (Author)

AD-261 223 Div. 4, 25
(14 Aug 61) OTS price $6.60

Uppsala U. (Sweden).
REPORT FROM THE INTERNATIONAL SUMMER INSTITUTE AND SYMPOSIUM IN QUANTUM CHEMISTRY HELD AT UPPSALA UNIVERSITY, UPPSALA, SWEDEN. JULY 17-AUGUST 21, 1960.
1960, 60p. incl. table (Technical note no. 58)
(Contract AF 61(052)351)
(ARL-107)
Unclassified report

DESCRIPTORS: *Chemistry, *Symposia, *Quantum mechanics, *Solid state physics, Molecular spectroscopy, Molecular structure, Atomic structure, Atomic spectrum, Theory.

The 2 primary fields of interest reported for this symposium were concerned with quantum chemical concepts and analysis of wave functions. Emphasis was placed on the mathematical structure of quantum chemistry because of its importance in the present day development of the field. The entire program of the Institute consisted of a 3-wk introductory course followed by an advanced 2-wk course incorporating a symposium on the quantum theory of matter. Abstracts of the papers presented at the symposium are included on subjects represented in the following fields: Nuclear motion, molecular vibrations, bond lengths, and isotope effects; correlation problem; spin resonance; mathematical aspects on quantum chemistry; Ligand field theory; many particle theory; conjugation, hyperconjugation, and conjugated systems; molecular spectroscopy; atoms in molecules; computation methods; exchange and superexchange mechanisms; and solid state theory.

AD-261 319 Div. 4
(14 Aug 61) OTS price $1.60

Trinity Coll., Dublin (Eire).
MAGNETOCHEMICAL BEHAVIOUR OF THE 7-SUBSTITUTED 8-HYDROXYQUINOLATES OF NICKEL.
Final technical rept. no. 1, 1 Oct 59-1 Oct 60,
by William J. Davis and Ronald E. Burton.
1 July 61, 14p. incl. tables.
(Contract DA 91-591-EUC-1281; Continuation of Contract DA 91-591-EUC-960)
Unclassified report

DESCRIPTORS: *Quinolines, *Nickel compounds, *Complex compounds, Hydroxides, Synthesis, Magnetic susceptibility, Methyl radicals, Bromides, Chlorides, Molecular spectroscopy, Infrared spectroscopy, *Chelate compounds, Stereochemistry, Ultraviolet spectroscopy, Chemical bonds, Pyridines, Chloroform, *Metal-organic compounds.

The investigation was limited to the Ni complexes formed by the following 8-hydroxyquinolines: 7-methyl-8-hydroxyquinolines, 7-bromo-8-hydroxyquinoline, and 7-chloro-8-hydroxyquinoline. All three formed 2 complexes, the expected bis complex Ni(C9H5ONX)2 and a complex in which an extra molecule of the hydroxyquinoline was included in the solid. The latter is easily removed in vacuo by sublimation. The methyl derivative differs from the halo derivatives, which are paramagnetic, by forming a diamagnetic bis complex. Widely differing values for the effective magnetic moment of the Ni atom in the complexes was obtained. Results of IR and absorption spectra studies are discussed. The molecular extinction coefficients for the bis complexes indicate that the methyl complex has a much stronger absorption at 340 and 450 to 480 microns than the halo derivatives.

AD-261 340 Div. 4
(16 Aug 61) OTS price $1.60

Delaware U., Newark.
NEW SYNTHETIC APPROACHES TO SEVEN-MEMBERED HETEROCYCLIC COMPOUNDS.
Final rept. 1 Jan 60-30 June 61,
by James A. Moore. 25 July 61, 15p. incl. illus.
(Contract DA 18-108-405-cml-654)
Unclassified report

DESCRIPTORS: *Heterocyclic compounds, Amines, *Polycyclic compounds, Amides, *Benzenes, Phenyl radicals, Formamides, Stereochemistry, Nitrogen compounds, Chemical reactions, Synthesis, Molecular structure.

Attempts were made to prepare compounds with a completely unsaturated seven-member N heterocyclic ring fused to a benzene ring. Efforts to synthesize 1H-1-benzazepine, and 1,3 benzodiazepine were unsuccessful. Two crystalline products were obtained from the reaction of o-aminophenylacetamide with formamide without solvent. The more soluble compound was identified as oxindole. The less soluble product, obtained in about 10% yield, had the composition C10H8O2N2 corresponding to the incorporation of 2 moles of formamide with loss of 2 moles of ammonia, i.e., formation of the desired diazepine ring and additional formylation.

AD-261 345 Div. 4, 30
(17 Aug 61) OTS price $.75

Feltman Research Labs., Picatinny Arsenal, Dover N. J.
AN EBULLIOMETER FOR LOW-MOLECULAR-WEIGHT POLYMERS,
by Oscar R. Abolafia. July 61, 31p. incl. illus. tables (Technical rept. no. FRL TR 42)
(Proj. 592-32-004)
Unclassified report

DESCRIPTORS: Polymers, *Molecular weight, Thermometers, Organic solvents, Boiling, Vapor pressure, Temperature, Measurement, Differential equations, Design, Reliability, Laboratory equipment.

The ebulliometer described in this report is a modified Menzies-Wright type which can be used to determine number-average molecular weights up to several thousand with reasonably good precision. The performance of the apparatus with a limited number of materials of known molecular weight is discussed. The apparatus employs a commercial Menzies-Wright differential water vapor pressure thermometer which is shown to operate linearly in the range of observed boiling point elevations. An attempt was made to keep the design of the apparatus as simple as possible while maintaining an adequate level of performance. The results of the experimental runs show a reproducibility within ± 2% and comparable accuracy in the molecular weight range investigated from 178 to 595. (Author)

5. COMMUNICATIONS

AD-261 092 Div. 5
(11 Aug 61) OTS price $15.00

ITT Communication Systems, Inc., Paramus, N. J.
UNIVERSAL COMBINED RADIO RELAY AND TROPO SCATTER EQUIPMENT. VOLUME I.
15 July 61, 228p. incl. illus. tables, 37 refs.
(Rept. no. C1183-TR-4)
(Contract AF 30(635)12857)
(RADC TR 60-246, vol. 1) Unclassified report

Original contains color plates: All ASTIA reproductions will be in black and white. Original may be seen in ASTIA Hq.

DESCRIPTORS: *Radio communication systems, *Radio equipment, *Radio relay systems, Radio waves, Scattering, Atmosphere, Broadband, Specifications, Design, Radio stations, Test equipment, *Air force communications, *Radio receivers, *Test sets, Radio transmitters, Telephone communication systems, Human engineering, Multiplex transmission, *Multichannel telephone systems, Diversity systems, Signal-to-noise ratio, Reliability, Ultra high frequency, Super high frequency, *Microwave communication systems.

The design criteria is presented for a group of electronic building blocks which may be joined to provide a series of high capacity, long range radio relay and tropospheric scatter subsystems intended for use in reliable trunkline communication systems. Reliability is the keynote of the selected design criteria. The emphasis is not merely on equipment reliability, but on message reliability as well. Intelligence introduced into the system must be clearly reproduced at the output. This objective is achieved through a combination of approaches, including a variety of equipment, diversity operation provisions and control and monitor facilities, which identify and report on faulty system components. Human engineering is also an important contributor to reliability. (Author)

AD-261 093 Div. 5
(11 Aug 61) OTS price $14.00

ITT Communication Systems, Inc., Paramus, N. J.
UNIVERSAL COMBINED RADIO RELAY AND TROPO SCATTER EQUIPMENT. APPENDICES I-XIII. VOLUME II.
15 July 61, 207p. incl. illus. 21 refs. (Rept. no. C1183-TR-5)
(Contract AF 30(635)12857)
(RADC TR 60-246, vol. 2)

Unclassified report

DESCRIPTORS: *Radio communication systems, *Radio equipment, *Radio relay systems, Radio waves, Scattering, Atmosphere, Radio stations, Design, *Air force communications, *Microwave communication systems, Sidebands, Modulation, Frequency modulation, Telephone communication systems, *Multichannel telephone systems, Multiplex transmission, Reliability, Diversity systems.

Contents: Interim USAF 480L AIRCOM system performance specification - transmission subsystem; Comparative study of diversity combining methods; Angle diversity; Tabulated pre-emphasis characteristics; 2500 km system performance and calculations; Bandwidth approximations for FM systems; Intermodulation distortion due to a single echo in FDM-FM systems; Preliminary FM-SSB comparison for tropo scatter communications; Radio relay site selection and evaluation; Sample feeder distortion calculations; Modulation methods for line-of-sight and beyond-the-horizon radio communication links; Survey of specifications for buildings used for existing radio relay and tropo scatter stations.

AD-261 182 Div. 5, 6, 8
(14 Aug 61) OTS price $12.00

Litton Systems, Inc., Waltham, Mass.
ERROR PROBABILITIES FOR NON-ORTHOGONAL M-ARY SIGNALS UNDER PHASE-COHERENT AND PHASE-INCOHERENT RECEPTION.
by Albert H. Nuttall. 15 June 61, 153p. incl. table, 70 refs. (Technical rept. no. TR-61-1-BF)
(Contract Nonr-332000)

Unclassified report

DESCRIPTORS: Errors, Probability, Mathematical prediction, *Communications theory, Signal-to-noise ratio, *Communication systems, Detection, Statistical distributions, *Information theory, Data transmission systems, Attenuation, Coding, Mathematical analysis, *Radio signals, *Radar signals, *Sonar signals, Multipath transmission, Wave transmission, Integrals.

Formulas for the error probabilities of non-orthogonal M-ary signals under optimum phase-coherent and phase-incoherent reception are derived in the form of previously untabulated single and double integrals. Two modes of reception are considered. In the first, one of M equal energy equiprobable signals is known to be transmitted during a baud of T seconds and subjected to additive white Gaussian noise. There is no fading and only one path is available for communication (no multipath). In the second mode of reception, the only difference is that a threshold is incorporated in the receiver. If the largest correlation value is less than the threshold, a decision is made that no signal was transmitted; if the largest correlation value exceeds the threshold, the signal corresponding to that particular correlation value is decided to have been transmitted. Applicability of the results to related problems and non-white and non-stationary noise is discussed, and bounds on performance in such situations are pointed out. (Author)

AD-261 255 Div. 5, 33
(15 Aug 61) OTS price $2.75

National Aviation Facilities Experimental Center, Atlantic City, N. J.
EVALUATION OF AN AIR TRAFFIC CONTROL VOICE COMMUNICATIONS SWITCHING SYSTEM OPERATIONAL TECHNICAL TEST.
Interim rept on Phase 1,
by Thomas F. Edwards. Apr 61, 140p. incl. illus. tables.

Unclassified report

DESCRIPTORS: *Voice communication systems, *Air traffic control systems, Acceptability, Tests, Human engineering, Data processing systems, Design, Circuits, Air traffic controllers, Control simulators, Control systems, Communication systems, Communication equipment, Electronic equipment, Switches, Electronic switches, Electrical networks.

A portion of the No. 300 Switching System was evaluated for compliance with stated specifications. This evaluation was conducted on a functional operational level, not in conjunction with an air traffic control environment. The features of the system tested performed satisfactorily. Before final determination is made of the system for communications support of an air traffic control facility, the Air Traffic Control Operational Environment Evaluation Test, Phase II, must be concluded. (Author)

AD-261 329 Div. 5, 8
(17 Aug 61) OTS price $8.10

Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
STUDY OF A SPEECH COMPRESSION SYSTEM (SPECTRUM SELECTION).
Interim rept. no. 2 (Final), 15 Jan 60-15 May 61, by Karl D. Kryter. 21 July 61, 82p. incl. illus. tables, 13 refs. (Rept. no. 6)
(Contract DA 36-039-sc-78078)

Unclassified report

DESCRIPTORS: *Speech transmission, Intelligibility, *Band pass filters, *Voice communication systems, Tests, Design, Electronic circuits, Narrowband.

A study is presented of a speech bandwidth compression scheme. A six-channel filter system was built; each channel had a bandwidth of either 135 or 400 measured at the 20 db downpoints on the filter skirts. With this system, plus a previously built three-channel system having filters 650 wide, PB word intelligibility and talker recognition tests were conducted for systems having various combinations of filter bandwidths and center frequencies. It was found that for 80% PB word intelligibility and equal talker recognition test scores the total bandwidth required for the best multiple pass band system is 1/3 - 1/4 that required for a low pass band system. It was concluded that narrow band filtering plus time-plexing among the bands does not provide an intelligible speech signal. (Author)

Division 6-DETECTION

AD-261 410 Div. 5, 30
(17 Aug 61) OTS price $1.60

Stelma, Inc., Stamford, Conn.
DEVELOPMENT OF TELETYPEWRITER TEST SET, AN/UGM-2.
Interim progress rept. no. 7, 1 June 60-30 Apr 61,
by L. O. Richards and R. Mottino. 30 Apr 61, 14p. incl. illus.
(Contract DA 36-039-sc-78072, Proj. 3-89-21-751)
Unclassified report

DESCRIPTORS: *Test sets, Test equipment, *Teletype systems, Telegraph equipment, Signal generators, Telegraph signals, Display systems, Design.

Work on teletypewriter test set AN/UGM-2 progressed from the engineering-test-model to the service-test-model phase. Electrical and mechanical design specifications are essentially firm. Further study and evaluation of several Signal Corps suggestions should determine the practicability of their inclusion in the final design. Fabrication of ten service test models of the AN/UGM-2 was begun. (Author)

AD-261 462 Div. 5, 28, 18
(18 Aug 61) OTS price $8.60

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
ANALYSIS OF GENERAL COMMUNICATIONS QUESTIONNAIRE.
Interim rept. no. 3 on People, Organizations and Communications. An Operations Research Study of Army Communications,
by Clifton E. Mayfield and Joel N. Bloom. May 61, 92p. incl. illus. tables (Rept. no. I-A2313-3)
(Contract DA 36-039-sc-78332)
Unclassified report

DESCRIPTORS: *Communication systems, Data, *Military communications, Military organizations, Effectiveness, Operations research, Tests, Test methods, Attitudes, Measurement, Human engineering, *Attitudes, Military personnel *Operations research.

The questionnaire which is the subject of this report is part of an Operations Research Study of the interrelationships of people, communication methods, and organizational concepts within the army. It is directed toward: an understanding of the staff officer's beliefs and attitudes toward present and modified communication systems and procedures; measurement of respondent bias; and determination of critical incidents, which, although rare, may be of overall significance. (Author)

6. DETECTION

AD-260 860 Div. 6, 8, 19
(9 Aug 61) OTS price $2.50

Airborne Instruments Lab., Deer Park, Long Island, N. Y.
INSTRUCTION MANUAL FOR BEACON VIDEO DEFRUITING EQUIPMENT FAA/BRD TYPE 2.3NS9.
Final engineering rept.
Feb 61, 46p. incl. illus. tables (Rept. no. 7407-1)
(Contract FAA/BRD-111)
Unclassified report

DESCRIPTORS: *Radar beacons, Identification, Radar equipment, Design, Interference, Reduction, Aircraft, Electronic circuits, Electronic equipment, Storage tubes, Power supplies, Installation, Maintenance, Instruction manuals, *Air traffic control systems, Packaging, Video signals, Reliability, *Identification systems, Radar interference.

The design and development of the FAA Type 2.3NS9 Beacon Video Defruiting Equipment is presented. The purpose of this equipment is to eliminate any non-synchronous beacon replies from the received video signals before they are passed to the decoder. The equipment utilizes three storage tubes to obtain the necessary delay. Defruiting can be performed with jittered PRF systems. A one to one interlace capability is included in the design. (Author)

AD-260 891 Div. 6, 30
(9 Aug 61) OTS price $8.10

General Dynamics/Fort Worth, Tex.
AEROSPACE GROUND EQUIPMENT FOR THE AN/APQ-69 (XH-1) HIGH RESOLUTION RADAR,
by P. J. Schappert and J. B. Houck. 30 June 61, 83p. incl. illus. tables (Rept. no. FZM-4-1544)
(Contract AF 33(600)32517)
Unclassified report

DESCRIPTORS: *Search radar, *Radar scanning, Radar equipment, Airborne, *Aerial reconnaissance, Instrumentation, *Mapping, Photographic recording systems, Jet bombers, Jet planes, Ground support equipment, Maintenance, Test equipment, *Test sets, Handling, Maintenance equipment.

The Aerospace Ground Equipment (AGE) necessary to support the AN/APQ-69 (XH-1) High Resolution Radar System is discussed. The task of supplying the special or unique equipment for the High Resolution Radar System is presented from 3 viewpoints. In the System Analysis Review, emphasis is placed on present built-in capabilities and changes recommended for a tactical system. In the section on Minimum Support - Concept and Logistics, an operational concept, maintenance plan, and recommended AGE for a minimum support effort are outlined. The third viewpoint is presented as the Full Capability Plan; in this section, the operational concept, maintenance plan, and recommended AGE described are appropriate when a sufficient number of systems are procured to warrant the development of additional special support equipment. (Author)

AD-260 933 Div. 6, 8
(9 Aug 61) OTS price $2.60

Stanford Research Inst., Menlo Park, Calif.
POSITION-LOCATION NETWORK STUDY.
Quarterly progress rept. no. 3, 1 Jan-31 Mar 61, by J. H. Priedigkeit and E. A. Elpel. Apr 61, 23p. incl. illus.
(Contract DA 36-039-sc-84966)
Unclassified report

DESCRIPTORS: *Position finding, *Direction finding, *Radio receivers, Radio transmitters, Tuning devices, Automatic, Remote control systems, Radio signals, Coding, Radio teletype systems, Bearing finding, Data processing systems, Data transmission systems, High frequency, Electronic circuits, Teletype systems, Design, Tests, Radio equipment.

Effort was devoted to the completion and demonstration of the equipments to automatically encode tuning instructions from a master R-390/URR HF radio receiver into teletype signals, and to automatically decode the teletype signals and servo-tune one or more slave R-390/URR HF radio receivers of a direction-finding network. The investigation of semi-automatic bearing read-out, and the preliminary processing of field data were continued. Tentative solutions to these two problems were formulated. (Author)

AD-261 134 Div. 6
(14 Aug 61) OTS price $3.60

Aerospace Corp., Los Angeles, Calif.
PRELIMINARY RADIOMETER CALIBRATION STUDY,
by Frank W. Hoch. 1 June 61, 34p. incl. illus.
(Rept. no. TDR-594(A1242-01)TR-1)
(Contract AF 04(647)594)
Unclassified report

DESCRIPTORS: *Radiometers, Calibration, Errors, Standardization, Measurement, Thermal radiation, Infrared radiation, *Infrared detectors, *Infrared tracking, Infrared filters, Recording devices, Tests, Transducers, Spectrographic data, Sensitivity, Attenuation, Atmosphere, Blackbody radiation, Thermal targets, Instrumentation, Re-entry vehicles, Guided missile noses.

Infrared radiometers are discussed. After an introductory description of radiometer system components, the effects of several factors on calibration are discussed. These include analysis of tracking error, effect of variation in sensitivity over the surface of a detector, atmospheric attenuation, non-linear response and narrow band filtering. It is concluded that the individual contributions to calibration error of these factors are small, but collectively they might be quite significant. (Author)

AD-261 328 Div. 6, 19
(16 Aug 61) OTS price $9.60

Bendix Radio Div., Bendix Corp., Baltimore, Md.
DEVELOPMENT OF AN EXPERIMENTAL ANTENNA PATTERN ANALYZER AN/ASM-13.
Final engineering rept.
14 Apr 61, 120p. incl. illus. tables.
(Contract AF 30(602)1924)
(RADC TR 61-106) Unclassifed report

DESCRIPTORS: *Radar antennas, Antennas, *Antenna radiation patterns, Airborne, *Radar interception, Doppler radar, *Doppler navigation, Very high frequency, Ultra high frequency, Recording devices, Airplane antennas, Transport planes, Design, Tests, Radar receivers, Power supplies, Measurement, Test equipment, Data transmission systems, Automatic pilots, Radar navigation.

Research was concerned with the development of an airborne radar antenna pattern analyzer which incorporates a logarithmic receiver. The pattern analyzer is capable of rapidly gathering data on antenna patterns of ground-based radars. An automatic aircraft guidance system was also developed for use with the antenna pattern analyzer. The aircraft guidance system is capable of causing an aircraft to fly a course of constant range around a ground antenna whose pattern is being mapped. The equipment immediately produces a pattern whose gross details are readily discernible by antenna engineers, and the fine detail can be reduced to an accuracy sufficient for the purpose of a scientific antenna pattern analysis. The system is a prolific generator of data and, in general, can produce data much faster than it can be reduced by manual techniques. (Author)

AD-261 365 Div. 6, 30
(17 Aug 61) OTS price $1.10

Lincoln Lab., Mass. Inst. of Tech., Lexington.
COMPUTER SIMULATION OF THE PURE-PHASE PERIODOGRAM AND THE DOPPLER PHASE DIFFERENCE INTEGRATOR,
by S. F. Catalano and E. J. Jones. 12 Sep 58, 8p. incl. illus. (Group rept. no. 47-19)
(Contract AF 19(122)458)
Unclassified report

DESCRIPTORS: *Computers, *Simulation, Radar, Radar signals, Detection, Mathematical analysis, Communications theory, Noise (Radar), Statistical distributions, *Doppler systems, *Phase detectors, *Integrators, Moving target indicators.

AD-261 445 Div. 6, 8
(18 Aug 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
INFRARED VIDICON.
10 July 61, 4p. incl. illus. (AID rept. 61-102; Trans. from Infrared Vidicon; Tekhnika Kino i Televideniya 4.15-19, Apr 61)
Unclassified report

DESCRIPTORS: *Camera tubes, Infrared equipment, Infrared radiation, Black body radiation, Photosensitivity, USSR, Technological intelligence, Design, *Infrared image tubes, Electrodes, Lead compounds, Oxides, Hydrogen compounds, Sulfides, Targets, *Infrared detectors, *Infrared television systems, Thermal targets, Detection.

The principal requirements for infrared-sensitive vidicons are presented together with the development of special target electrodes. Special investigation methods and measuring equipment were developed to obtain the basic characteristics of IR-sensitive vidicons and were used to compare them with non-Soviet makes, particularly the American RCA-7038. Results of such a study are presented. (Author)

AD-261 473 Div. 6
(18 Aug 61) OTS price $2.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
TRACKING SYSTEMS EMPLOYING THE DELAY-LOCK DISCRIMINATOR.
Rept. on Communications,
by M. R. O'Sullivan. July 61, 26p. incl. illus.
(Rept. no. 5-10-61-7)
Unclassified report

DESCRIPTORS: *Delay lines, Discriminators, *Tracking, Range finding, Measurement, Radar beacons, Correlation techniques, *Radar tracking, Radio interferometers, Radar equipment, Signal-to-noise ratio, Low pass filters, Errors, Taylor's series.

A delay-lock discriminator is described. It is a statistically optimum device for measuring the delay between two correlated waveforms. The application of this device to range- and angle-measuring systems is discussed. Utilization of the delay-lock discriminator can lead to substantial simplification as compared to tracking systems relying exclusively on phase-lock loops. Such improvements result because the delay-lock loop is free of the ambiguities inherent in phase-lock measurements. The characteristics of presently available delay lines, an essential component of the delay-lock loop, and, in particular, the limited accuracy of which they are capable at present prohibits the immediate exploitation of the full capability of the delay-lock technique. For this reason, an attractive possibility for an immediate implementation is a hybrid system in which a delay-lock measurement is made to resolve ambiguities, while a phase-lock measurement determines the ultimate accuracy. A combined range- and angle-tracking system employing this hybrid concept is described, in which the delay-lock measurement is made on a low-pass noise waveform which, for transmission purposes, is applied as amplitude modulation to a stable carrier. (Author)

7. ELECTRICAL EQUIPMENT

AD-260 878 Div. 7, 8
(8 Aug 61) OTS price $8.10

Autonetics, Downey, Calif.
ELECTRICAL AND ELECTRONIC TEST EQUIPMENT. A PARTIALLY ANNOTATED BIBLIOGRAPHY,
by Marnelle Kinney. 13 July 61, 81p. 230 refs.
(Rept. no. EM-6647)
Unclassified report

DESCRIPTORS: *Bibliography, *Electronic equipment, *Electrical equipment, Test equipment, Automatic.

This bibliography on electrical and electronic test equipment consists of reports and articles published from 1956 to 1961. There are 230 references arranged alphabetically by title, followed by author, periodical, and subject indexes. (Author)

AD-261 097 Div. 7
(11 Aug 61) OTS price $1.10

Mechanical Products, Inc., Jackson, Mich.
DEVELOPMENT OF THREE-POLE, SINGLE ACTUATOR AIRCRAFT CIRCUIT BREAKER.
Interim rept. no. 6, 10 Jan-7 Feb 61,
by R. A. Leiper. 7 Feb 61, 4p. incl. illus.
(Contract NOa(s) 60-6123-f)
Unclassified report

DESCRIPTORS: *Circuit breakers, Electrical equipment, *Aircraft equipment, *Thermal switches, Servomechanisms, Airborne, Design.

Research was continued on the development of a 3-pole single actuator circuit breaker. Work is nearing completion on the 5 and 7-1/2 amp ratings, and is progressing rapidly on the 15, 25, and 35 amp ratings. Progress on the 15, 25, and 35 amp ratings indicates that the same thermal unit assembly design used in the 2 lower ratings may also be applicable to these 3 higher ratings. This indication, if it proves to be a reality, should reduce development time. A number of various thermal wire materials and sizes are now being tested. (Author)

AD-261 173 Div. 7, 8
(14 Aug 61) OTS price $5.60

Hamilton Standard Div., United Aircraft Corp., Broad Brook, Conn.
STUDY AND DEVELOPMENT OF TRANSISTORIZED MODULAR POWER CONVERTERS.
Quarterly progress rept. no. 3, 1 Jan-31 Mar 61, by Frank L. Raposa. 31 Mar 61, 47p. incl. illus.
(Rept. no. HSER 2326)
(Contract DA 36-039-sc-85369, Proj. 3G18-02-001-01)
Unclassified report

DESCRIPTORS: Transistors, *Power supplies, Direct current, *Rectifiers, Voltage amplifiers, *Voltage regulators, *Electronic circuits, *Power transformers, Reliability, Design, Electrical networks, Diodes, Capacitors, Oscillators, Electric filters, Electronic equipment.

Investigations were continued on the following topics: (1) methods of voltage regulation, (2) methods of voltage sensing, (3) methods of obtaining multiple output voltages, and (4) methods of obtaining multiple output power levels. At least 2 approaches in each topic were made with the advantages and disadvantages in the modular concept discussed. In voltage regulation methods, output regulation is compared to input regulation and multiple sensors for multiple output voltages are compared to a single sensor for multiple output voltages. In methods of obtaining multiple output voltages, different output transformers are compared to a single output transformer and in methods of obtaining mulitiple power output levels, separate power stages are compared to parallel power stages. A typical modular system is presented which illustrates the flexibility of the modular concept. A breakdown of the concept results in 19 basic modules to cover 2 input voltage ranges, delivering any power output up to 300 watts at 10 different output voltages, the output being either regulated or non-regulated. This results in a total of 188 different power supplies. (Author)

AD-261 342 Div. 7, 4
(16 Aug 61) OTS price $4.60

Engelhard Industries, Inc., East Newark, N. J.
FUEL CELL CATALYSTS.
Quarterly rept. no. 3, 1 Jan-31 Mar 61,
by A. P. Hauel, W. C. Pfefferle, and P. A. Danna. 31 Mar 61, 47p. incl. illus. tables.
(Contract DA 36-039-sc-85043)
Unclassified report

DESCRIPTORS: *Fuel cells, *Catalysts, *Electrodes, Organic compounds, Liquids, Fuels, Electrochemistry, Electric potential, Measurement, Oxygen electrodes, Oxidation, Platinum, Acids, Metals, Polarization, Palladium catalysts, *Power supplies, Cathodes (Electrolytic cells), Carbon dioxides, Methanols, Formic acids, Sulfuric acids, Anodes (Electrolytic cells), Electrolytes, Phosphoric acids.

Further studies on cathodic oxygen reduction at platinum in acid media have shown that efficient catalysts can be prepared of both platinum black and of carbon carrier based catalysts. Oxygen potentials in acid electrolyte become adversely affected by the presence of carbon dioxide even in concentrations comparable to those present in atmospheric air. Methanol and formic acid are completely converted anodically into carbon dioxide and water by platinum at ordinary temperatures. Platinum is also effective for anodic oxidation of some other organic compounds at ordinary temperatures. Of the precious metals, platinum is the only one of distinct catalytic activity for anodic oxidation. Satisfactory open circuit potentials were obtained with methanol, formic acid and benzene. These fuels, however, caused severe polarization of platinum anodes under load. At acid conditions sulfuric acid and phosphoric acid appear to be equally suitable electrolytes for oxidation of methanol, at neutral conditions phosphate electrolytes are superior. (Author)

AD-261 455 Div. 7
(18 Aug 61) OTS price $3.60

Science and Tech. Section, Air Information Div., Washington, D. C.
CELESTIAL MECHANICS AND OPTIMUM METHODS. PART I. OPTIMUM METHODS AND DYNAMIC PROGRAMMING.
Background rept. for 1956-1960.
17 July 61, 35p. 28 refs. (AID rept. 61-103)
Unclassified report

DESCRIPTORS: *Control systems, *Servo systems, USSR, Mathematical analysis, Design, Synthesis, Bibliography, Technological intelligence, Automatic, Differential equations, Difference equations, *Celestial mechanics, Programming, Dynamics.

The most important articles published in the USSR during the period 1956-60 which directly or indirectly concern the maximum principle of L. S. Pontryagin are reviewed. This principle is a hypothesis which serves as a basis for the solution of a general problem on determining the optimum-rate control process. The opinion expressed in these and other articles published in the USSR is that this principle provides an effective method in the study of optimum problems where quite general restrictions are imposed on control functions and can be applied to a very wide class of problems.

AD-261 456 Div. 7, 12, 25, 20
(18 Aug 61) OTS price $3.60

Science and Tech. Section, Air Information Div., Washington, D. C.
SOURCES AND CONVERSION OF ENERGY IN SPACE-VEHICLE POWER SYSTEMS. A REVIEW OF SOVIET OPEN LITERATURE.
Rept. no. 1 for 1958-1960.
26 July 61, 27p. incl. table, 55 refs. (AID rept. 61-104)
Unclassified report

DESCRIPTORS: *Spaceships, *Satellite vehicles, *USSR, *Power supplies, Electrical equipment, Semiconductors, Solar cells, Thermoelectricity, Production, Physical properties, Chemical properties, Design, Bibliography, Technological intelligence, Electric power production, Radioactive batteries, Solar energy, Materials, Purification.

Contents
Early research and development
Semiconductor research
Theoretical and experimental work
Solar batteries
Thermoelectric power
Nuclear batteries
Current developmental trends
Research problems in thermoelectricity
Utilization of solar energy
Use of atomic batteries
Current studies
Research on power-system semiconductor materials
General considerations
Purification of semiconductor materials
Physical and chemical characteristics of semiconductors
The search for new materials

AD-261 459 Div. 7, 8, 20
(18 Aug 61) OTS price $7.60

Admiral Corp., Chicago, Ill.
EVALUATION - DEVELOPMENT OF MIL-C-14157B CAPACITORS,
by E. R. Pfaff. July 61, 80p. incl. tables.
(Scientific rept. no. 8)
(Contract NObsr-77612)
Unclassified report

DESCRIPTORS: Capacitors, *Paper capacitors, *Dielectric films, Radiation damage, Reduction, Gamma rays, *Mica capacitors, Life expectancy, Tests, Propyl radicals, Silicone resins, Cyanates, Diphenyl, Failure (Mechanics), Electrostatic capacitance, Temperature, Measurement.

The following types of capacitors performed exceptionally well in the 1000 hour test, and the capacitance and dissipation factor essentially did not change: (1) second control test Bendix (E-200) capacitors, (2) control and irradiated units with Samica dielectric film impregnated with monoisopropylbiphenyl dielectric fluid, and (3) control and irradiated units with Samica dielectric film impregnated with C-oil resin. The control and irradiated units with Samica dielectric film and a silicone resin impregnant had the best survival rate; however, changes in capacitance, dissipation factor and insulation resistance in the irradiated group were excessive. Isocyanate treated Mylar units impregnated with monoisopropylbiphenyl failed in less than 30 hours. All but one of the modified linear polyester dielectric film units failed prior to the end of the test. (Author)

AD-261 470 Div. 7, 20
(18 Aug 61) OTS price $8.10

General Atomic Div., General Dynamics Corp., San Diego, Calif.
PARAMETRIC STUDY OF THERMIONIC-NUCLEAR ELECTRICAL POWER SOURCE EMPLOYING NONBOILING, NATURAL-CIR-

CULATION WATER COOLING,
by John Dunlay and Fred R. MacDonald. 7 Aug 61, 81p. incl. illus. tables (Rept. no. GA-2170) (Contract Nonr-337100)

Unclassified report

DESCRIPTORS: *Electric power production, Heat transfer, Coolants, Cooling, Power plants, *Power supplies, *Nuclear power plants, *Thermionic emission, Thermoelectricity, Fuel elements, Reactor cores, Light water reactors.

Parametric nuclear and heat-transfer calculations are presented which establish approximate values of critical fuel loadings and core diameters for Navy-oriented thermionic-nuclear power sources in the electrical output power range from 500 kw to 10 mw. The nuclear cores consist of an array of cylindrical fuel elements utilizing light water as the coolant, moderator, and reflector. Each fuel element contains a grouping of series-connected thermionic cells arranged axially within the fuel-element cladding. Natural-circulation, nonboiling cooling is considered. Two source configurations are selected that represent, at the present time, best estimates of the design parameters compatible with electrical power outputs of 1 and 10 mw. (Author)

AD-261 477 Div. 7, 30, 8
(18 Aug 61) OTS price $2.60

Aeronautical Structures Lab., Naval Air Material Center, Philadelphia, Pa.
A PROTOTYPE ELECTRONIC SYSTEM FOR CONTROL OF STORAGE BATTERY POWER,
by Richard Friedman. 28 July 61, 19p. incl. illus. (Rept. no. NAMATCEN-ASL-1046, pt. 1)

Unclassified report

DESCRIPTORS: *Storage batteries, *Voltage regulators, Pulse transformers, Phase shifters, Alternating current, *Aerodynamic heating, Simulation, *Test facilities, High temperature research, Power supplies, Control systems, Programming, Thyratrons, *Electronic systems, Electron tubes.

A 100 kw prototype electronic system for controlling storage battery power was developed which employs ignitron control tubes, a special pulse transformer, and a unique phase shifter. Photographs are presented of waveforms appearing in various portions of the control system. The system waveforms are compared with the waveforms of a back-to-back ac ignitron control system. (Author)

8. ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-260 819 Div. 8, 7
(8 Aug 61) OTS price $7.60

Diamond Ordnance Fuze Labs., Washington, D. C.
TECHNICAL REVIEW NO. 5, JULY 1961.
July 61, 75p. incl. illus. table.
Unclassified report

DESCRIPTORS: *Intermediate frequency amplifiers, Design, Tests, *Subminiature electronic equipment, Amplifiers, Antenna radiation patterns, *Antennas, Mathematical analysis, Slot antennas, *Telemeter systems, Frequency modulation, Modulation, Telemetering data, Audiofrequency, Broadband, Electric filters, *Dry cells, Miniature electrical equipment, High pass filters, Low pass filters, Radiofrequency filters, Electronic circuits, Electrical networks, Electrochemistry.

Contents:
A 2D 30-Mc IF amplifier
Azimuthal pattern of slotted array antennas on a cone
Complementary filtering
A new electrochemical system for high voltage, low current drain applications

AD-260 821 Div. 8, 25
(8 Aug 61) OTS price $2.60

Diamond Ordnance Fuze Labs., Washington, D. C.
PULSED GAMMA INITIATION OF BREAKDOWN IN GAS TUBES, by Alan J. Talbert and Neil D. Wilkin.
10 July 61, 24p. incl. illus. (DOFL rept. no. TR-961)
(Proj. no. 54050)
Unclassified report

DESCRIPTORS: *Gamma rays, *Gas discharges, *Electric discharges, Gamma counters, Diodes, *Cold cathode tubes, *Nuclear explosions, *Radiation effects, Radiation damage, Electronic switches.

Miniature cold-cathode diodes of the GE XD series were subjected to pulses of gamma radiation from the electron linear-acceleration (linac) facility to determine under laboratory conditions the values of gamma dose and dose rate required to initiated breakdown in the diodes at different bias voltages. Elapsed time between gamma pulse onset and diode breakdown was measured. Curves are presented of the relationship between gamma dose and diode breakdown as a function of diode voltage. The data are compared with similar data taken in Operation Plumbbob (Nevada 1957). The results show that each of the diodes tested is applicable to nuclear-proofing devices with corresponding operating voltage range. (Author)

AD-260 824 Div. 8
(8 Aug 61) OTS price $1.60

Diamond Ordnance Fuze Labs., Washington, D. C.
A METHOD OF ANALYZING UNKNOWN SIGNAL PARAMETERS, by Frank Vrataric. 30 June 61, 25p. incl. illus.
(DOFL rept. no. TR-955)
(Proj. nos. 11110, 14711, and 20520)
Unclassified report

DESCRIPTORS: Analysis, Noise (Radar), Noise (Radio), Detection, Modulation, Intensity, Telemetering, *Radar signals, Electronic circuits, Radar interference, *Telemetering data, Signal-to-noise ratio, Radar reflections, Plan position indicators, Photographic recording systems, Photographs.

A simple inexpensive method of analyzing and/or determining signal parameters of unknown purpose or origin, including signals in the presence of noise, is described. The method is an adaption of intensity modulation techniques used in radar systems and employs readily available laboratory equipment. It also employs a moving film camera but techniques for obtaining quasi-instantaneous outputs are described. Other possible uses, such as phase detection, frequency comparison and telemetry evaluation are also described. (Author)

AD-260 826 Div. 8, 25
(8 Aug 61) OTS price $5.60

Electro-Mechanics Co., Austin, Tex.
A SIMULATOR FOR THE FORMULATION OF INTERFERENCE SPECIFICATIONS AND FOR THE DETERMINATION OF SPECIFICATION COMPLIANCE. PART 3. A STUDY OF SOME OF THE PARAMETERS REQUIRED FOR THE SIMULATION OF AN ELECTROMAGNETIC ENVIRONMENT.
Final rept. Section 9, pt. 3 on Interference Measurement Techniques and Specifications.
31 Mar 60, 53p. incl. illus. tables.
(Contract AF 30(602)1884, Proj. 4540; Continuation of Contract AF 30(602)1622)
(RADC TN 61-162) Unclassified report

DESCRIPTORS: *Electromagnetic effects, *Radar interference, Guided missiles, Dielectric properties, Specifications, Conductivity, Inductance, Measurement, Simulation, Voltage, Frequency, Radar signals, Electrostatic capacitance, Electromagnetic waves, Antennas, Soils, Radio transmitters, Radar transmitters, Urban areas, Radar receivers, Radio fields, *Electromagnetic fields, Electrical properties, Radar antennas, Interference, *Electromagnetic properties, Wave transmission, Tests, Radio interference, Radio receivers, Radio signals.

A technique is developed for predicting spurious radiation from a transmitter to the electromagnetic environment at a distant station. Measurements of the voltages at the spurious frequencies, impressed by the transmitter on a quarter-wave antenna (tuned to the carrier), suffice to make it possible to calculate the voltages induced in a receiving antenna (tuned to the respective frequencies). The calculated voltages are directly dependent on the spurious voltages impressed on the transmitting antenna, directly proportional to the wave length of the spurious signals, and inversely proportional to the distance from transmitter to receiving station. Field tests were made which indicated that there was a correlation between the calculated values of voltages at the receiver and those actually observed by voltage measurements at the receiving antenna. (Author)

AD-260 857 Div. 8, 26
(8 Aug 61) OTS price $1.10

General Dynamics/Electronics, San Diego, Calif.
APPLICATION OF NEW MATERIALS AND TECHNIQUES IN ELECTRON GUN FABRICATION.
Interim development rept. 1 Apr-30 June 61.
28 July 61, 8p. incl. illus.
(Contract NObsr-81208)
Unclassified report

Division 8 - ELECTRONICS AND ELECTRONIC EQUIPMENT

DESCRIPTORS: *Electron guns, *Cathode ray tubes, Production, Manufacturing methods, Machining, Molding, Design, Materials, Tests, Glass.

A 5AQP7 tube with a molded split cylinder gun has been sent to the Bureau of Ships. A second tube has been completed and will undergo a complete evaluation. The mold for the Phase II complete cylinder gun is almost finished, and delivery of the molded parts is anticipated about the end of July. Some exploratory experiments into the techniques required for the unitized tube in Phase III have begun. (Author)

AD-260 858 Div. 8
(8 Aug 61) OTS price $5.60

General Electric Co., Schenectady, N. Y.
RESEARCH AND DEVELOPMENT OF SUPERPOWER THYRATRONS.
Quarterly progress rept. no. 13 on Phase 2-b, 25 Feb-24 May 61,
by A. W. Coolidge. 24 May 61, 47p. incl. illus. tables.
(Contract DA 36-039-sc-74850)
Unclassified report

DESCRIPTORS: *Thyratrons, Electron tubes, Hydrogen, Anodes, Electrodes, Distortion, Design, Tests, Switching circuits.

Efforts were continued on the development of thyratron tubes capable of switching a peak power of 50 megawatts at an average power of 200 kilowatts. Full objective ratings have not been achieved when using a saturable reactor in the anode lead, when using an anode design intended to distribute anode dissipation, or when utilizing a charging circuit having charging triodes. This suggests that anode dissipation and recovery time are not the sole factors which limit the Z-5212 to subobjective power levels. Test data are presented on Z-5212, Nos. 9A, 11A, and 13. The highest performing tube, No. 11A, is capable of operating steadily at 35 KV, and seven amperes average. Distortion of the gradient grid is discussed. (Author)

AD-260 859 Div. 8
(8 Aug 61) OTS price $6.60

General Electric Co., Owensboro, Ky.
A STUDY OF FILMS IN ELECTRON TUBES.
Interim quarterly technical rept. no. 4, 1 Feb-1 May 61,
1 May 61, 60p. incl. illus. tables.
(Contract NObsr-81225)
Unclassified report

DESCRIPTORS: *Electron tubes, *Thin films, Surfaces, Films, Analysis, Electron diffraction analysis, Neutron activation, Optical analysis, Spectrographic analysis, X-ray spectroscopy, Mass spectroscopy, Sublimation, Gases, Tests.

A new method was developed for analyzing surface films on anodes, grids, and micas before exposing the tube parts to a gaseous environment. Several crystalline films on anodes and grids were identified, including MgO, BaSiO3, Al2O3, NiO, and others. Optical emission spectrography was adapted to the study of grid films and the analysis of the migration of cathode impurities. Eleven elements, Mg, Si, Mn, Ti, Fe, Co, Al, Cu, Ag, Cr, and Ba were measured quantitatively by this technique. Neutron activation techniques are being employed primarily to mica surface films and to grid films. Co-60, Na-24, and Sc-46 were identified on the surface of MgO-coated micas. Na was also present in the grids in rather high concentrations. Increases in Mn and Na were detected in grids during life. A fairly good calibration of the crystal oscillator film monitor was accomplished by evaporating Au on the quartz crystals and determining the quantity of Au by neutron activation.

AD-260 864 Div. 8
(8 Aug 61) OTS price $2.60

Times Wire and Cable Co., Inc., Wallingford, Conn.
DESIGN AND DEVELOPMENT OF A WATERTIGHT LOW LOSS STABLE R. F. CABLE.
Interim development rept. 24 Mar-24 June 61,
24 June 61, 28p. incl. illus. table (Engineering rept. no. 216-C)
(Contract NObsr-81424)
Unclassified report

DESCRIPTORS: *Radiofrequency cables, Electric cables, Moistureproofing, Standing wave ratios, Impedance, Design, Tests, Attenuation, *Coaxial cables, Measurement, Test methods, Stability.

Results of the VSWR sweep test performed on the RG-217/V cable indicated that small impedance discontinuities can cause large standing waves over narrow frequency bands. These large standing waves are not always detectible from both ends of the cable. The watertightness test was conducted on 18 sample constructions of which 10 met the minimum requirement of 10 cc maximum leakage after exposure to 25 p.s.i. for 6 hours. The watertightness test results were used to narrow the sample constructions for manufacture and further investigation. (Author)

AD-260 866 Div. 8
(8 Aug 61) OTS price $6.60

Research Inst., U. of Michigan, Ann Arbor.
STUDY AND INVESTIGATION OF A UHF-VHF ANTENNA.
Quarterly progress rept. no. 4, 1 Jan-1 Apr 61,
by A. T. Adams, R. M. Kalafus and others.
June 61, 63p. incl. illus. table (Rept. no. 3667-4-P)
(Contract AF 33(616)7180, Proj. 3667)
Unclassified report

DESCRIPTORS: Antennas, *Airplane antennas, Airborne, *Countermeasures, *Biconical antennas, *Loop antennas, Ferrites, Ferromagnetic materials, Dielectrics, Ultra high frequency, Very high frequency, Broadband, Radio waves, Electric fields, Partial differential equations, Functions, Scattering, Electromagnetic theory, Materials, Bibliography, Design, Tests, Theory, Spheres, Cylindrical bodies, Impedance.

A solution to the problem of scattering of plane waves from a material sphere was derived. Results to date indicate regions of high energy density within the sphere that may make possible the design of small antennas with large effective apertures. The results of this study will be more completely analyzed and presented in later reports. Substantial progress was made in the solution of scattering of plane waves from a material cylinder. Measurements on ferrite antennas were begun and problems of RF technique were encountered and partially solved. It is apparent that all test antennas should be as efficient as possible and all equipment be ade-

quately shielded. The study on a comparison of solid-state and conventional antennas indicates several techniques for determining the usefulness of any given antenna. (Author)

AD-260 892 Div. 8, 5
(8 Aug 61) OTS price $13.00

Electro-Mechanics Co., Austin, Tex.
ADVANCED RECEIVER AND TRANSMITTER INTERFERENCE MEASUREMENT TECHNIQUES.
Suppl. to Sections 2 and 3 of the final rept. on Interference Measurement Techniques and Specifications,
by P. Varlashkin, W. T. Cronenwett and others.
1 May 60, 183p. incl. illus. tables (Suppl. to AD-260 826)
(Contract AF 30(602)1884, Proj. 3766)
(RADC TN 61-161) Unclassified report

DESCRIPTORS: *Radio receivers, *Radio transmitters, *Radio interference, *Radio communication systems, Measurement, Communication systems, *Radio signals, Interference, Distortion, Fourier analysis, Noise (Radio), Harmonic analysis, Impedance, Modulation, Tests, Signal generators, Reduction, Radiofrequency filters, Low pass filters, Electromagnetic waves, Radio altimeters, Airborne, Vulnerability, Calorimeters, Electromagnetic fields, *Radiofrequency power, Electronic equipment, Semiconductors, Radar receivers, *Radar interference, *Radar signals, Effectiveness.

Some of the basic parameters to be measured in the evaluation of the radio-frequency characteristics of transmitters and receivers are described. An attempt was made to develop techniques which result in absolute rather than relative data. Emphasis was placed on measurements made at the equipment antenna terminals. Methods of measuring radiated power are described and preliminary test results on several proposed techniques are given. The problems inherent to power-type measurements are analyzed and several methods of performing radiated power measurements are described. Experimental data is given to show the feasibility of methods. A liquid flow calorimetric power measurement device for use in determining calibration accuracies of test equipment as well as for making power measurements directly is described. (Author)

AD-260 897 Div. 8, 14, 26, 12
(8 Aug 61) OTS price $4.60

National Beryllia Corp., Haskell, N. J.
DEVELOPMENT OF FABRICATION TECHNIQUES FOR BERYLLIUM OXIDE RADOME MATERIALS.
Final rept.
June 61, 43p. incl. illus., 12 refs.
(Contract NOw 60-0057)
Unclassified report

DESCRIPTORS: *Radomes, *Materials, Oxides, Beryllium compounds, Dielectric properties, *Porous materials, Viscosity, Hydrogen compounds, Peroxides, Density, Measurement, Foams, Physical properties, Porosity, *Manufacturing methods, Processing, *Ceramic materials, Refractory materials, High temperature research, Guided missiles.

A study was made to determine the effect of processing variables such as density, crystal size, and chemical purity on the dielectric and related physical properties of BeO radome materials. It was concluded that a beryllia foaming process produces in the material in lightweight uniform structure with maximum physical properties. The advantage of the process is that the resultant pore structure is entirely closed and relatively uniform as compared to the type of pore structure resulting from burnout methods or underfiring methods. The superiority of this type of foam was evidenced by the comparatively good mechanical strength obtained in the BeO body, even with densities as low as 30% as theoretical. Dielectric measurements made on the material at 9375 mc indicate dielectric constant values of approximately 2.5 for such a foam, and loss tangents measured as low as .0003. As a result, the general conclusion can be drawn that beryllia as a foam has many properties which are suitable for radome and microwave window applications. (Author)

AD-260 899 Div. 8, 1
(9 Aug 61) OTS price $2.60

Narmco Industries, Inc., San Diego, Calif.
ALUMINA RADOME ATTACHMENT.
Quarterly rept. no. 1,
by William L. Bassett, Francis M. Wilson, and Roger A. Long. July 61, 15p. incl. illus.
(Contract AF 33(616)8157)
Unclassified report

DESCRIPTORS: *Radomes, Ceramic materials, *Bonding, Aluminum compounds, Oxides, Molybdenum alloys, Titanium, Argon, Zirconium, Materials, Refractory materials, *Airframes, Temperature, Tests, *Joints, Design, Elasticity, Polariscopes, Stresses, Attachment.

The development of alumina radome attachments was divided into 2 phases. Phase I was devoted to chemical bonding of both the active metal seal type and the metallized ceramic type. In preliminary tests, the active metal technique, whereby the alumina is coated with titanium hydride and placed in contact with a braze foil which in turn is in contact with the refractory metal, appeared to be superior. Excellent, but lower, use temperature bonds were formed initially. Phase II consisted of mechanical attachment engineering studies. A polariscope technique was employed to analyze stress distributions of various attachment configurations. An advanced investigation of simulated elevated temperature (2500F) attachment conditions, utilizing room temperature substitutes for alumina and refractory metals at 2500F, was initiated. (Author)

AD-260 901 Div. 8
(21 Aug 61) OTS price $8.60

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
LINK AMPLIFIER AS A CODED-PULSE GENERATOR AND MATCHED FILTER,
by R. S. Kalluri. 15 Apr 61, 94p. incl. illus. tables, 19 refs. (Technical rept. no. 64; Research rept. no. EE 491)
(Contract DA 36-039-sc-85272)
Unclassified report

DESCRIPTORS: *Pulse generators, Coding, Radiofrequency filters, Delay lines, Signal to noise ratio, *Amplifiers, Fourier analysis, Range finding, Radar equipment, Electrical networks, Least squares method, Matrix algebra, Mathematical analysis, Communications theory, Synthesis, Theory, *Signal generators.

A new coded-ptl/e generator and matched-filter system was realized using tapped delay lines as the plate and grid lines of the link amplifier. If the grid line of the link amplifier is supplied with an input of the form sin t/t, the output taken from the normally unused end of the plate line forms the coded-pulse signal in the ideal case. The matched filter to this coded signal is the same amplifier with the coded pulse supplied to the normally unused end of the grid line. In this method the summing operation is distributed in the link-coupled system; the output stray capacitances of the active elements are absorbed in the delay line and do not add to lower the gain-bandwidth product of the system. As a result matched filters with larger bandwidths than the conventional type, which have a tapped delay line and summing amplifier, can be constructed successfully. All-pass constant-resistance delay sections are synthesized for maximally flat delay using even-order Bessel polynomials. Since the ideal input sin t/t is not realizable, other practical signals suitable to serve as the input to the coded-pulse generator are discussed. (Author)

AD-260 921 Div. 8, 7
(8 Aug 61) OTS price $5.60

Rand Corp., Santa Monica, Calif.
INDUSTRIAL EQUIPMENT SPECTRUM SIGNATURES,
by H. A. Myers. 16 June 61, 50p. incl. illus. 23 refs. (Research memo. no. RM-2764)
(Contract AF 49(638)700)
Unclassified report

DESCRIPTORS: *Electronic equipment, *Electrical equipment, *Interference, *Radio interference, *Industrial equipment, Rectifiers, Transmission lines, Welding, Ignition systems, Induction motors, Induction heating, Electric motors, Very low frequency, Audiofrequency, Wave transmission, Electric welding, Reduction, Detection, Airplane noise, Noise (Radio), Noise, Diathermy.

A survey is presented of the radiation characteristics (spectrum signatures) of electrical and electronic equipments such as rectifiers, welders, power lines, switching devices, ignition systems, induction heaters, and electric motors. Several equipment signatures were compiled from interference reports, which indicated that some industrial activities radiate strongly enough to cause interference at ranges up to a few miles, and that most of the energy is concentrated in the low-frequency portion of the spectrum. The equipments mentioned were measured at very low frequencies, and the graphs show strong and unique signatures in the SLF and ULF (30 to 3000 c) bands. (Author)

AD-260 981 Div. 8
(10 Aug 61) OTS price $3.60

Amersil Quartz Div., Engelhard Industries, Inc., Hillside, N. J.
(No title).
Final rept.,
by Richard E. Sell. 24 Feb 61, 28p. incl. illus.
(Contract AF 30(602)2127, Proj. 4506)
(RADC TR 61-150) Unclassified report

DESCRIPTORS: *Delay lines, Quartz, Coils, Helixes, Electromagnetic waves, Design, Tests, Effectiveness, Propagation, Quartz crystals, Aluminum, Transducers, Angle of arrival, High frequency.

The development of fused quartz coiled delay lines is described. The results are believed to constitute an advance in the state of the art in the field of coiled delay lines. Quartz lines were made for center frequencies of 5 mc and higher, which is well beyond those feasible with metal-wire delay lines. (Author)

AD-260 991 Div. 8, 25
(10 Aug 61) OTS price $2.60

Hughes Research Labs., Malibu, Calif.
STUDY OF BOMBARDMENT-INDUCED-CONDUCTIVITY MATERIALS.
Interim scientific rept. no. 3, 15 Mar-14 July 61, by N. H. Lehrer. 14 July 61, 24p. incl. illus.
(Contract AF 33(616)7563)
Unclassified report

DESCRIPTORS: *Storage tubes, *Display systems, *Dielectric films, *Electron bombardment, Conductivity, Thin films, Zinc compounds, Sulfides, Dielectrics, Measurement, Ion bombardment.

Three different techniques for measuring the conduction ratio in thin films of zinc sulfide were investigated. Both the sandwich and the low-energy holding-beam techniques yielded consistent and reliable data. In contrast, data obtained by the high-energy holding-beam technique were found to be inconsistent and unreliable. The effect on the conduction ratio of thermally processing the zinc sulfide dielectric was examined. When measured by the sandwich technique, such thermally processed films exhibited a substantial increase in the conduction ratio as compared with untreated films. When an electron beam instead of a conductive layer was used to establish the potential of the upper surface of the dielectric, it was possible to separate electrode contact effects from volume effects in the dielectric film. For dielectric films having two electrode contacts as well as those having one electrode contact and an electron beam to establish the potential across the film, the same proportionate increase in conduction ratio was obtained when the dielectric was thermally processed. (Author)

AD-260 992 Div. 8, 26
(10 Aug 61) OTS price $9.10

Hamilton Standard Div., United Aircraft Corp., Windsor Locks, Conn.
DEVELOPMENT PROGRAM FOR MODULAR INTERCONNECTIONS FOR MICRO-ASSEMBLIES.
Final progress rept. 30 Dec 60-30 Apr 61, by Robert H. Homstead. 30 Apr 61, 101p. incl. illus. tables.
(Contract DA 36-039-sc-85347)
Unclassified report

DESCRIPTORS: *Subminiature electronic equipment, *Electric connectors, Materials, Welding, Tests, Welded joints, Manufacturing methods, Electron beams, Aluminum compounds, Oxides, Nickel plating, Metal coatings, Miniature electronic equipment, Resistance, Reliability.

The development of a technique for fabricating reliable, welded, electronic micro-assembly connections with a termination density up to 1600 junctions per square inch resulted in electron beam welding using the Hamilton-

Zeiss electron beam machine. This is a statistically predictable, exceptionally reliable joining process. The process has a capability of fabricating 1600 terminations per square inch in a system configuration required in the Signal Corps Micro Module Program. (Author)

AD-261 007 Div. 8, 6, 30
(15 Aug 61) OTS price $10.50

Technical Research Group, Somerville, Mass.
A LINE SOURCE FEED FOR A SPHERICAL REFLECTOR,
by Alan F. Kay. 29 May 61, 126p. incl. illus. tables, 10 refs.
(Contract AF 19(604)5532)
(AFCRL-529) Unclassified report

DESCRIPTORS: *Ionosphere, *Scientific research, *Radar reflectors, *Waveguides, Design, Tests, Transmission lines, Radar antennas, Integral equations, Mathematical analysis, Polarization, Structures, Model tests, Ultra high frequency, Optics, Spheres, Waveguide slots, Antenna radiation patterns.

The electrical design of a UHF, dual polarized, high power line source feed for a 1,000 foot diameter spherical reflector is described. Topics covered include basic theory, effects of structural design, tolerance, cross-polarization coupling, electrical tests, pattern calculations, VSWR, high power breakdown, spillover, and bandwidth. (Author)

AD-261 020 Div. 8
(10 Aug 61) OTS price $4.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
POLARIZATION VARIATION OF ELLIPTICALLY-POLARIZED RADIATORS.
Rept. on Antenna Phenomena Research,
by T. S. Chu and R. G. Kouyoumjian. 31 Oct 60, 42p. incl. illus. tables, 14 refs. (Rept. no. 1035-7)
(Contract DA 36-039-sc-84920, Proj. 3-99-00-000)
Unclassified report

DESCRIPTORS: *Antennas, Polarization, Theory, Antenna radiation patterns, Mathematical analysis, Integral equations, *Dipole antennas, *Loop antennas, *Helical antennas, Reflectors, Measurement.

Three general theorems giving conditions for a radiating system to exhibit stationary polarization, stationary gain and the coincidence of stationary polarization and gain in a prescribed direction are presented; these differ significantly from the earlier theorems of Bouix because of a sign error in his work. A necessary and sufficient condition for the polarization invariance of a circularly-polarized radiator is derived. The theorems are applied to a number of circularly polarized sources and antennas which are broadly directional. The polarization change with respect to aspect for the radiators possessing a direction of stationary polarization at the pattern maximum is small; however, in the case of the helix, whose pattern maximum is not in the direction of stationary polarization, the change is comparatively large. The polarization variation which occurs when these antennas are used as the elements of an array or the primary feed of a reflector is considered. (Author)

AD-261 021 Div. 8, 25
(10 Aug 61) OTS price $2.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
THE MAGNETO-IONIC THEORY FOR DRIFTING PLASMA.
Rept. on Ion Sheath Research,
by H. Unz. 15 July 61, 23p. (Rept. no. 1021-6)
(Contract AF 33(616)6782)
Unclassified report

DESCRIPTORS: *Electromagnetic waves, *Plasma physics, Drift, Refraction, Refractive index, Algebra, Electromagnetic wave reflections, Propagation, Mathematical analysis, Partial differential equations.

The magneto-ionic theory for the case of drifting plasma with constant drift velocity is developed. The refractive index is shown to be the solution of an algebraic equation of the sixth order. In several particular cases the algebraic equation is solved explicitly. (Author)

AD-261 022 Div. 8
(10 Aug 61) OTS price $2.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
THE INTERFERENCE PATTERN OF TWO ELECTRIC DIPOLES IMMERSED IN A CONDUCTING MEDIUM.
Rept. on Ion Sheath Research,
by Sinclair Chen. 15 July 61, 13p. incl. illus.
(Rept. no. 1021-7)
(Contract AF 33(616)6782)
Unclassified report

DESCRIPTORS: *Dipole antennas, Antennas, *Antenna radiation patterns, Mathematical analysis, Plasma physics, Gas ionization, Interference, Differential equations, Conductivity, Ionosphere.

The field patterns of two electric dipoles immersed in a conducting medium and arranged either as a broadside array or as a colinear array have been investigated. The effects of the degree of conductivity and the spacing between the dipoles on the interference pattern have been considered in detail. The results are compared with those of an ordinary array in free space. (Author)

AD-261 027 Div. 8
(10 Aug 61) OTS price $3.60

Rand Corp., Santa Monica, Calif.
SOME RESULTS ON NEW CLASSES OF MATCHED FILTERS,
by D. Middleton. 12 July 61, 34p. 16 refs.
(Rept. no. RM-2625)
(Contract AF 49(638)700, Proj. RAND)
Unclassified report

DESCRIPTORS: *Radiofrequency filters, *Signal-to-noise ratio, Radar signals, Radio signals, Detection, Identification, Radio reception, Linear systems, Transformations (Mathematics), Sampling, Integral equations, Functions, Communications theory, Mathematical analysis, Mathematical prediction, Statistical processes, Nonlinear systems.

A new class of more advanced filters is examined for which the design criterion is the automatic decision process that occurs when the signals are detected or measured in noise. For example, in the detection of a radar signal the process might involve deciding whether or not a target is present, or it might involve measuring the signal

in the sense of determining the position or velocity of a radar target. It is shown how a new class of filters which have optimal properties is conceived theoretically, and the approach is indicated to their design and construction for actual use. (Author)

AD-261 029 Div. 8, 25, 1
(10 Aug 61) OTS price $16.50

Stanford Research Inst., Menlo Park, Calif.
PRECIPITATION CHARGING AND CORONA-GENERATED INTERFERENCE IN AIRCRAFT.
by R. L. Tanner and J. E. Nanevicz. Apr 61, 251p. incl. illus. tables, 73 refs. (Technical rept. no. 73)
(Contract AF 19(604)3458)
(AFCRL-336) Unclassified report

DESCRIPTORS: *Airplane antennas, Interference, Radio interference, Radar interference, Noise (Radio), Noise (Radar), *Precipitation static, *Electrical corona, Electric discharges, Airplanes, Experimental data, Model tests, Reduction, Dipole antennas, Loop antennas, Mathematical analysis, Integral equations, Differential equations, Probability, Measurement.

The factors which determine the magnitude and spectra distribution of the radio interference occurring when an aircraft is operated in precipitation, called precipitation static, were studied. The first of these, the coupling between the antenna and the noise source is discussed with the aid of a reciprocity relationship. A technique for measuring absolute values of coupling factor as a function of frequency and position on the aircraft was developed. The second factor is the spectral character of the corona-noise source. Included in the study of this factor was an investigation of the manner in which the source spectrum is affected by altitude. The third factor is the magnitude of the discharge current and its distribution among the discharging extremities. Methods for determining the discharge current were devised and the problem of determining the distribution was investigated. To test the validity of the theory and the results of the laboratory work, calculations were made to predict the noise currents induced in the two test antennas employed in a flight-test program conducted on the Boeing 367-80. Although most of the research was done with dipole-type receiving antennas in mind, a brief investigation was made of the characteristics of loop antennas.

AD-261 042 Div. 8, 25
(9 Aug 61) OTS price $2.60

Air Force Cambridge Research Labs., Bedford, Mass.
MICROWAVE GENERATION IN YTTRIUM-IRON GARNET SUBJECTED TO PULSED MAGNETIC FIELDS,
by M. H. Stiglitz and F. R. Morgenthaler. Apr 61, 17p. incl. illus. (Rept. no. AFCRL-195)
(Proj. 4601)
Unclassified report

DESCRIPTORS: *Single crystals, Yttrium compounds, Iron compounds, Garnet, Magnetic fields, *Radiofrequency generators, Microwaves, Paramagnetic resonance, Crystals, S band, Crystal oscillators, Theory, *Ferromagnetic materials, Ferrites, Tests, Design.

It is shown that a single-crystal yttrium-iron garnet (YIG) subjected to pulsed magnetic fields while in resonance will generate microwave energy. The simplest explanation of the physics involved is that a single-crystal YIG, given some initial magnetic energy while in resonance and subjected to a rapidly established pulsed magnetic field, will be raised to a higher-resonance frequency, and will under suitable conditions be free to radiate this energy at the higher frequency. The garnet crystals compared in these experiments were polished spheres, 1.5-mm and 3-mm in diameter, of 0.5 oersted and 5-oersted X-bandline width. The maximum frequency translation obtained in these experiments was approximately 2 kmc. The qualitative and quantitative data obtained on the rf pulses generated in the YIG include the output-to-incident power ratio, frequency spectrum limits, output pulse shapes, and the effect of rotating the dc bias field with respect to the garnet and the cavity. (Author)

AD-261 048 Div. 8, 5
(9 Aug 61) OTS price $7.60

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.
STUDIES OF ELECTROMAGNETIC COMPATIBILITY OF EQUIPMENT AND SYSTEMS.
Quarterly progress rept. no. 1, 1 Nov 60-31 Jan 61,
by F. Haber, D. E. Mode, and others. 28 Feb 61, 72p. incl. illus. tables, 13 refs. (Rept. no. 61-11)
(Contract NObsr-85170)
Unclassified report

DESCRIPTORS: *Radio interference, Measurement, *Underwater communication systems, *Radio communication systems, Electrical corona, Simulation, Meters, Test equipment, Electric cables, Transmission lines, Radio interference analyzers, Test methods, Design, Interference, Propagation, Coupling circuits, Electromagnetic waves, Submarine noise, *Submarines, Communication systems, Shielding, Coaxial cables, Submarine hulls, Wave transmission.

The work on simulation of power line corona noise by means of a pulse modulated Gaussian noise was completed. A method for selecting parameters for the simulator is presented. Procedures for inter-comparing noise meter readings obtained on so-called direct-reading peak and quasi-peak detectors are made. In order to make such comparisons, it is necessary to know the nature of the noise source. A detailed discussion of the approach used to analyze and evaluate noise in underwater communications systems is presented. Models are included of the possible sources and means of propagation. It is believed that one of the major factors in such systems is the transfer of electromagnetic energy within the hull to critical positions immediately outside the hull. (Author)

AD-261 049 Div. 8
(10 Aug 61) OTS price $14.00

Radio Corp. of America, New York.
PRODUCT IMPROVEMENT-TYPE 7029 PHOTOMULTIPLIER TUBE.
Summary rept. 17 Nov 58-3 Mar 60,
by W. K. Peifer. May 60, 204p. incl. illus. tables.
(Contract AF 33(600)38095, Proj. 4156)
(WADD TR 60-564) Unclassified report

DESCRIPTORS: *Photomultipliers, Stability, Design, Tests, Noise, Secondary emission, Cesium, Gases, Pressure, Feedback, Luminescence, Manufacturing methods, Thermionic emission.

Measurements and experiments directed to the improvement, especially with regard to stability, of the RCA 7029 photomultiplier are described.

The development of improved stability testing procedures and the effect of varying tube design parameters are described. In addition to stability, excess low frequency noise was found to be a problem in the 7029. On the basis of these measurements a new tube type, designated the RCA C 70038 has been developed. This type has improved stability, less low frequency noise, and an envelope of improved mechanical design. (Author)

AD-261 077 Div. 8
(23 Aug 61) OTS price $1.10

Compagnie Generale de Telegraphie Sans Fil (France).
TROPOSPHERIC PROPAGATION FIELD MEASUREMENTS WITH SPACE DIVERSITY AT THE RECEIVER,
by Victor Biggi. 25 Nov 60, 5p. incl. illus.
(Technical note no. 1.709 RS)
(Contract AF 61(052)442)
(AFCRL-560) Unclassified report

DESCRIPTORS: Radio waves, Electromagnetic waves, *Propagation, Atmosphere, Superhigh frequency, *Radio signals, Diversity reception, Backward wave oscillators, *Radio transmission.

Information is to be collected on the conditions of tropospheric propagation over a given frequency band and for various distances between two aerials used in diversity reception. The investigation will be made in the 3200 to 3400 mc band which will be scanned linearly and successively in the increasing and decreasing sense, at a rate of about 0.1 second. Results will be so presented as to allow a comparison to be made almost simultaneously of the signals received on the two receiving aerials. Investigation will be made with existing equipment which consists of: at the transmitting station, a carcinotron transmitter and a parabolic aerial 8 metres in diameter; at the receiving station, a receiver and an aerial identical to the above. (Author)

AD-261 120 Div. 8, 25, 12, 26
(14 Aug 61) OTS price $6.60

Bliley Electric Co., Erie, Pa.
PRECISION CRYSTAL UNITS FOR SATELLITE USE.
Final rept. 30 June 59-30 May 61,
by J. M. Wolfskill and R. T. Schlaudecker.
June 61, 65p. incl. illus.
(Contract DA 36-039-sc-84556, Proj. 3-26-00-700)
Unclassified report

DESCRIPTORS: *Quartz crystals, Crystals, *Satellite vehicles, Crystal ovens, Crystal holders, *Manufacturing methods, Design, *Frequency stabilizers, Very high frequency, *Quartz resonators, Radiofrequency, Tests, Stability, Radio equipment, Processing.

The investigation of HF crystal units indicated that those crystals which are thicker are more stable than the thinner crystals. In addition, it appears that the most desirable method of achieving the thicker crystals is through the use of lower frequencies and moderate overtones rather than the higher frequencies and the high overtones. Tests indicated that the 33 mc, 9th mode, Phase II type crystal units are best suited to the requirements. It was found that special low power ovens meet the requirements of the SCL-7513 specification, even though they are larger than desirable. Initial investigation of the parallel field crystals indicated that the principle has sufficient promise to justify further development. The high "Q's" and large inductance values which can be obtained in this manner should result in crystals that will be superior to any which can be made at the present state of the art. The bimetal compensation arrangement achieved improved frequency stability over wide operating temperature ranges without any significant penalty in activity levels. (Author)

AD-261 145 Div. 8, 25
(14 Aug 61) OTS price $4.60

Bell Telephone Labs., Inc., Whippany, N. J.
SOLID-STATE MASER RESEARCH.
Quarterly progress rept. no. 4, 20 Mar-20 June 61,
by H. E. D. Scovil. 20 June 61, 44p. incl. illus.
(Contract DA 36-039-sc-85357)
Unclassified report

DESCRIPTORS: *Microwave amplifiers, Amplifiers, X band, Magnetic fields, Gadolinium, Calcium compounds, Tungstates, Paramagnetic resonance, Lattices, Spin, Harmonic analysis, Ruby, Chemical impurities, Measurement, Paramagnetic crystals, Equations, Mathematical analysis, Dielectrics, Partial differential equations, Impedance, Electrical properties, Mechanical properties, Design.

Investigations were continued in the field of microwave solid-state masers. Work proceeded on 4 distinct projects. (1) Gadolinium in calcium tungstate as a maser material, discusses work at frequencies near 6 gc. In particular it was found that a push-pull operation exists which may allow the design of a fast-recovery maser. (2) Harmonic spin coupling, presents a continuation of an analytic study of the pumping of paramagnetics with harmonically related energy levels. (3) Space harmonic analysis of the comb-type slow-wave structure, is an analytic study of the comb and a contribution towards the space harmonic analysis of the empty comb. (4) Characteristics of a ruby maser at 6 gc, gives design data and performance characteristics of a 6.4 gc traveling-wave maser. (Author)

AD-261 150 Div. 8
(14 Aug 61) OTS price $2.60

Airborne Instruments Lab., Inc., Mineola, N. Y.
DEVELOPMENT OF TUNABLE C-BAND REACTANCE AMPLIFIERS.
Quarterly rept. no. 1, 28 Feb-31 May 61.
June 61, 23p. incl. illus. (AIL rept. no. 1124-I-1)
(Contract DA 36-039-sc-87405)
Unclassified report

DESCRIPTORS: C band, *Microwave amplifiers, Amplifiers, Tuning devices, Design, Broadband, Phase shifters, Diodes, Voltage, Band pass filters, *Tuned amplifiers.

Research is concerned with the design, development, and fabrication of tunable C-band reactance amplifiers that meet the following design goals: (1) tunable frequency range - 5250 to 5750 mc, (2) bandwidth - greater than 50 mc, (3) power gain - greater than 20 db, (4) noise figure - less than 4 db when operated at room temperature, (5) phase stability - less than 1 degree, and (6) gain stability - less than 0.1 db. A study was made to determine a simple means for tuning the amplifier and 3 possible solutions are discussed. The effect of pump power and pump frequency variations on the gain and phase stability of the amplifier was investigated. (Author)

Division 8 - ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-261 200 Div. 8
(14 Aug 61) OTS price $.50

Naval Research Lab., Washington, D. C.
TRANSISTORIZED RING-TYPE PULSE GENERATOR,
by J. M. Marzolf. 6 July 61, 4p. incl. illus.
(NRL rept. no. 5640)
Unclassified report

DESCRIPTORS: *Pulse generators, Transistors, Design, Electronic circuits, *Timing circuits.

A transistorized ring-type pulse generator has been developed which is a relatively simple means of obtaining a repetitive sequence of high-power timed pulses in separate output circuits suitable for triggering purposes. The output circuits are electrically insulated from the rest of the circuit, and consequently either positive or negative polarity may be obtained. The timing interval is based on the time required for a given transformer core to change from negative to positive saturation and vice versa when a step function of voltage is applied to the primary winding. Thus by changing the number of stages, size of core, number of turns, and input voltage, a wide range of timing intervals can be obtained. This circuit would be applicable wherever sequenced pulses at fixed time intervals are required or for timing or delay application. (Author)

AD-261 202 Div. 8, 25
(14 Aug 61) OTS price $1.60

Plasmadyne Corp., Santa Ana, Calif.
IONIZATION PROCESSES IN GASES.
Final rept.,
by Hendricus G. Loos. 31 Mar 61, 9p. illus.
(Rept. no. FR-031-655)
(Contract AF 49(638)655, Proj. no. 9751)
(AFOSR-998) Unclassified report

DESCRIPTORS: *Gas ionization, *Electric discharges, Electric current, Ionization, Gases, Electric fields, Hydrogen, *Gas discharges, Molecules.

The ionization occurring during the initial phase of an axisymmetric electrodeless discharge has been investigated. In the axisymmetric electrodeless discharge considered, the electric field and the currents are in the azimuthal direction, while the magnetic field is axial. If the capacitor bank is switched on in a time small compared with the period of the discharge, the electric field rises to its full value in a time during which the magnetic field is still very small. Then, a model is appropriate in which at the time zero the electric field is instantly present at its full value, while the magnetic field is zero. Therefore, there must exist a time interval for which the magnetic field can be neglected. This time interval is called the initial phase; it ends at time, t, which is defined as the time for which the magnetic force on an electron is 1/10 of the electric force. Since it is shown that during t the plasma does not move much in the radial direction, t is called the mass motion time. The analytical investigation has been restricted to the initial phase; the magnetic field has been neglected, but the electric field induced by the change of magnetic field is accounted for. (Author)

AD-261 203 Div. 8
(14 Aug 61) OTS price $1.60

Ionosphere Research Lab., Pennsylvania State U., University Park.
INVESTIGATION OF HIGH FREQUENCY PROPAGATION IN THE IONOSPHERE USING SATELLITE TRANSMISSIONS.
Quarterly status rept. no. 8, 15 Apr-15 July 61,
by W. J. Ross. 15 July 61, 13p.
(Contract AF 33(616)6157)
Unclassified report

DESCRIPTORS: *Ionosphere, High frequency, Propagation, *Satellite vehicles, *Telemeter systems, *Radio signals, *Recording devices, Refractive properties, Ionospheric propagation, Atmospheric sounding, *Communication systems.

The experimental programs carried out are reported on. A major revision in instrumentation and to some extent in objectives, has resulted from the failure of the projected Ionospheric Beacon Satellites, and the alternative use of satellites in the Transit series. In addition to the studies made under the present contract extension, reports are also made of other related projects which are conducted using satellite radio transmissions. (Author)

AD-261 212 Div. 8, 31, 6
(14 Aug 61) OTS price $5.60

Stanford Research Inst., Menlo Park, Calif.
CENTRALIZED MONITORING FOR SHIPBOARD ELECTRONIC SYSTEMS.
Final rept. on phase 2,
by R. M. Heintz. May 61, 55p. incl. illus. tables.
(Contract NObsr-81266)
Unclassified report

DESCRIPTORS: Monitors, *Electronic equipment, Radar equipment, Shipborne, Design, Tests, Simulation, *Naval equipment, Display systems, *Data processing systems, Detectors, Test equipment, Reliability.

The design and construction of a breadboard model centralized monitoring system for assessing and indicating the operational status of all electronic systems on a given ship is described. An AN/SPC-5 radar has been used as an example of a continuously monitored system and has been equipped with sensors for detecting variations in operating parameters. Sensor information is summed in a logic unit whose output is indicative of the over-all operational status of the radar. Provision is also made for automatic interrogation of each sensor individually in order to determine the approximate location of any malfunction. Indication of changes in status are displayed on a central panel; and, upon request of the monitoring personnel, failure report forms are automatically prepared and typed. Message information concerning the prime equipment and its associated sensors is maintained in a single reel of punched paper tape. A simulator representing the status signals from twenty-four hypothetical systems in addition to the AN/SPS-5 radar has been constructed for use with the display and message-handling equipment. With the simulator, it is possible to produce any desired frequency and degree of failure in any of the hypothetical systems for subjectively evaluating the monitoring technique. (Author)

AD-261 217 Div. 8, 5
(14 Aug 61) OTS price $8.60

Syracuse U. Research Inst., N. Y.
MULTIPLE ANGLE DIVERSITY.
Final rept.,
by R. A. Johnson. 28 June 61, 91p. incl. illus.
(SURI rept. no. EE 752-616F)
(Contract AF 30(602)2165)
(RADC TR 61-118)
Unclassified report

DESCRIPTORS: *Diversity systems, Radio signals, Attenuation, Communication systems, Radio communication systems, Radio receivers, Electronic circuits, Statistical processes, Signal to noise ratio, Reliability, Mathematical analysis.

Research is presented on two separate problems encountered in applying diversity techniques to improve the performance of communication systems. The first problem is the calculation of the performance of four models of idealized receivers. While similar calculations have been made previously the range of parameters is extended in the present work. Specifically, results are presented for the performance of a diversity system in which the input signal means may be different with or without correlation. The second problem is the analysis of a specific circuit (the Vector Combiner) for combining the several inputs to a diversity system. Although a complete analysis does not seem feasible in view of the many nonlinearities of the circuit, useful approximations are obtained for the case when the signal to noise ratio is large. (Author)

AD-261 218 Div. 8
(14 Aug 61) OTS price $1.60

Union Thermoelectric Corp., Chicago, Ill.
TESTS OF STANDARD MOUNTS FOR RESISTANCE TO SHOCK AND VIBRATION.
June 61, 14p. incl. illus. tables.
(Contract DA 36-039-sc-71061)
Unclassified report

DESCRIPTORS: *Crystal holders, Mounting brackets, Quartz crystals, *Quartz resonators, Vibration, Shock resistance, Vibration isolators, Quality control, Radiofrequency, Crystals, Tests, Gravity, Test equipment, Test methods, Failure (Mechanics), Design.

By using at least 2 types of available mounting systems, AT cut quartz resonator plates at any frequency above 1 mc can be mounted so as to withstand the required test for vibration resistance. At the lower frequencies it is necessary to use a special mounting system, such as the RCA claw, the RCA strap, or the Union Thermoelectric bumper-clip type, and to exercise close quality control. At the higher frequencies either the spring-clip mount or the tab-clip mount can be used. (Author)

AD-261 219 Div. 8, 26
(14 Aug 61) OTS price $1.60

Union Thermoelectric Corp., Chicago, Ill.
ULTRAMINIATURE QUARTZ CRYSTAL UNITS.
Quarterly progress rept. no. 4, 15 Mar-14 June 61,
by Jack W. Stringe. 14 June 61, 16p. incl. illus.
(Contract DA 36-039-sc-85348, Proj. 3A99-15-001-02)
Unclassified report

DESCRIPTORS: *Subminiature electronic equipment, *Quartz crystals, Crystals, *Quartz resonators, Quality control, Manufacturing methods, Impedance, Production, Test equipment, Design, Tests, Radiofrequency, Crystal holders, Glass.

Crystal units were fabricated which have quartz elements with a diameter of 0.100 in. Contoured plates were used to operate at 10 mc on the fundamental, and uncontoured plates to operate at 25 mc on the fundamental and at 75 mc on the third overtone. The requirement for a quality factor in excess of 10,000 was met in each case. The units were housed in a glass enclosure with dimensions of 3/16 in. x 5/32 in. x 1/16 in., and were solder sealed at each end. The enclosure ends were metalized with Hanovia 130-A. The elements were mounted with nickel wire 0.002 in. in diameter, using an epoxy cement. Crystal impedances as low as 350 ohms were achieved, as measured in the standard military test set, and data taken included a typical cubic type AT temperature curve. Fabrication methods and tooling are described. (Author)

AD-261 230 Div. 8
(15 Aug 61) OTS price $1.60

Adler Electronics, Inc., New Rochelle, N. Y.
DEVELOPMENT F. M. SIGNAL GENERATOR SG297.
Quarterly rept. no. 3, 2 Jan-30 Apr 61,
by C. K. Yutkowitz. 24 May 61, 11p. incl. illus.
(Rept. no. 7)
(Contract DA 36-039-sc-78106)
Unclassified report

DESCRIPTORS: *Signal generators, Frequency modulation, *Transistors, Electronic circuits, Diodes, Design, Tests.

Preparations were made to submit the first prototype generator for acceptance tests. This involved mating the RF box to the gear box, correcting hole locations, adding clamps, etc. Also, calibration charts were prepared of the RF oscillator and a master dial was fabricated. From the master, copies were produced and checked for calibration. The acceptance tests for the generator were performed and the results are presented. (Author)

AD-261 279 Div. 8, 26
(15 Aug 61) OTS price $10.50

RCA Defense Electronic Products, Camden, N. J.
MICRO-MODULE PRODUCTION PROGRAM.
Quarterly rept. no. 12, 1 Jan-1 Apr 61.
1 Apr 61, 138p. incl. illus. tables.
(Contract DA 36-039-sc-75968)
Unclassified report

DESCRIPTORS: *Subminiature electronic equipment, *Electronic circuits, Ceramic capacitors, Resistors, Packaging, Packaged circuits, Diodes, Transistors, Crystals, Quartz crystals, Crystal holders, Semiconductors, Materials, Reliability, Design, Tests, Thin films, Communication equipment, Computers, *Manufacturing methods, Production.

The initial program was virtually completed except for a small portion of the task on micro-modules. Approximately 80% of the required 640 modules of this program were made available either for use in subassemblies or for evaluation tests. All of the work on the improvement of processes for fabricating micro-modules, was accomplished. Final grade trimmer capacitors rated at 1.5-to-5 and 3-to-10 micromicrofarad were successfully constructed. Preliminary and prototype inductors with powdered-iron cores successfully passed all required tests, showing that the powdered-iron cores are superior to previously used ferrite cores for high-stability IF applications. A sensitivity of a 10 db signal-plus-noise to noise ratio for an input of less than 2 microvolts was exhibited by the first

prototype micromodular AN/PRC-34 receiver. Full limiting was achieved with a 5 microvolt input. A review of the MicroPac computer design disclosed that at least 200 modules can be eliminated from the control logic. A temperature sensitive circuit was devised to sense and compensate for temperature variations of the memory of the computer. (Author)

AD-261 281 Div. 8
(15 Aug 61) OTS price $2.60

Sperry Gyroscope Co., Great Neck, N. Y.
BEAM-TYPE PARAMETRIC AMPLIFIER.
Technical note no. 1, 19 Jan-1 Apr 61,
by G. White, J. Litton, and E. Cheatham. May 61, 30p. incl. illus. (Rept. no. NA-8210-8264-1)
(Contract AF 30(606)2433, Proj. 5573)
(RADC TN 61-110) Unclassified report

DESCRIPTORS: *Microwave amplifiers, X band, Amplifiers, Broadband, K band, Narrowband, Electron guns, Electron beams, Waveguides, Impedance, Circuits, Noise (Radio), Reduction, Design, Coupling circuits.

Research is concerned with the study of degenerate parametric amplification of 5-kmc signals with 10-kmc pumping, and nondegenerate parametric amplification of 5-kmc signals with 35-kmc pumping (30-kmc idler). The initial low-noise gun and beam refrigeration apparatus was completed. Signal couplers for degenerate broadband operation and zig-zag dispersive couplers were constructed. The 10-kmc pump circuit, a TE21 mode in loaded semi-open waveguide, showed satisfactory impedance and field shape. The nondegenerate operation requires high-frequency idler stripping and quadrupole pumping. The design of these circuits proceeded on the basis of the results obtained thus far. (Author)

AD-261 286 Div. 8, 25
(15 Aug 61) OTS price $10.50

Technical Research Group, Somerville, Mass.
APPLIED PROBLEMS IN ELECTROMAGNETIC THEORY.
Final rept.,
by Alan F. Kay. Apr 61, 167p. incl. illus. tables, 20 refs.
(Contract AF 19(604)3476)
(AFCRL-504) Unclassified report

DESCRIPTORS: *Antenna radiation patterns, *Antennas, *Electromagnetic waves, Propagation, Theory, Electronic scanners, Attenuation, Electromagnetic wave reflections, Electromagnetic theory.

Material on surface waves and electromechanical scanning is presented. Antenna structures studied include the uniform yagi, fakir's bed, corrugated and dielectric clad surfaces (both flat and cylindrical) and reactively loaded waveguide. Antennas built with these structures include yagis, omnidirectional antennas, and electromechanically scanned arrays. Topics emphasized include the surface wave excitation efficiency, phase and amplitude characteristics in the launching region, radiation patterns, ohmic losses, direct feed radiation, and tolerance effects. On most of these subjects both theoretical and measured data are presented. An improved method of predicting surface wave antenna patterns is described. Another topic studied theoretically was supergaining of large antennas, including physical interpretation of the supergain ratio, optimizing gain for a given supergain ratio, and optimizing sectoral efficiency. (Author)

AD-261 287 Div. 8
(15 Aug 61) OTS price $2.60

Technical Research Group, Somerville, Mass.
PATTERNS OF DISHES WITH MULTIPLE FEEDS.
Final rept.,
by Alan F. Kay. 13 June 61, 55p. incl illus. tables.
(Contract AF 19(604)5532)
(AFCRL-535) Unclassified report

DESCRIPTORS: *Antenna radiation patterns, Measurement, Lobing, Antennas, Microwave equipment, Reflectors, *Radar antennas, Parabolic antennas, Mathematical analysis, Wave transmission, Test methods, Antenna horns, Focusing, Electromagnetic lenses.

In certain applications it is desirable to form multiple radar beams with the same reflector by means of multiple feeds. The wide angle ability of paraboloids is very limited so that the beams of feeds off-axis have higher side lobes and lower gain. In some applications one may wish to transmit through all feeds simultaneously, producing one broad beam, and receive separately a narrow beam with each feed. The narrow beams together generate the broad beam and the information they contain constitutes a crude radar picture. The flexibility and increased range of separate transmitters and/or receivers is another feature of this type of system. In order to investigate specific cases, a computer program was written which computed the far field pattern of a circular paraboloid reflector with a finite collection of sources at or near the focus. In the special case, of a single source, the pattern of an off-axis source or defocussed source was obtained. (Author)

AD-261 291 Div. 8, 2
(15 Aug 61) OTS price $1.10

Radio Observatory, Calif. Inst. of Tech., Pasadena.
THE CENTRAL COMPONENT OF THE RADIO SOURCE CENTAURUS A,
by P. Maltby. 1961, 5p. incl. illus.
Unclassified report

DESCRIPTORS: *Radio astronomy, *Extraterrestrial radio waves, Sources, *Radio transmission, Radio interferometers, Measurement, Galaxies, Radio waves.

Sources of radio waves are investigated. Using the variable spacing interferometer at the Owens Valley Radio Observatory, Centaurus A was observed with different antenna spacings and in different orientations. The measurements were taken at wavelengths of 21.6 cm and 31.3 cm. In order to determine the position of the minor axis, the source was observed for about 2 hours on either side of upper culmination with a north-south interferometer. At the latitude of this observatory the source is close to the horizon, and a relatively long horizontal antenna separation is therefore needed to investigate the source in the north-south direction. From these

observations it is evident that the radiation originates in a region outside the wide dust band and that the sources lie on the polar axis of the galaxy. (Author)

AD-261 322 Div. 8, 25
(14 Aug 61) OTS price $1.60

Boston U., Mass.
HIGHER ORDER CONSERVATION LAWS IN THE THEORY OF STATIONARY ELECTROMAGNETIC FIELDS,
by P. Roman. June 61, 12p. (Scientific rept. no. 2)
(Contract AF 19(604)8022)
(AFCRL-530) Unclassified report

DESCRIPTORS: *Partial differential equations, *Electromagnetic fields, Electromagnetic waves, Tensor analysis, Mathematical analysis.

By imitating well-known techniques to obtain the energy-equation in Maxwell's theory, eight independent higher order conservation laws are found for the various second order correlation functions associated with stationary random electromagnetic fields. Two further conservation laws are deduced which involve the physically so significant energy coherence tensor and the flow coherence tensor. (Author)

AD-261 334 Div. 8, 30
(16 Aug 61) OTS price $3.60

Cook Electric Co., Morton Grove, Ill.
ALIGNMENT-CALIBRATION GROUP OA-2539/MSQ-16,
by Robert F. Grandy. Mar 61, 30p. incl. illus.
(Contract AF 30(602)2250)
(RADC TR 61-114) Unclassified report

DESCRIPTORS: Calibration, *Signal generators, Radio receivers, Very high frequency, Ultra high frequency, Superhigh frequency, Automatic, Programming, Antennas, Test equipment, Oscillators, Attenuation, Servo systems, Switching circuits, Radio transmitters, Broadband, *Parabolic antennas, Design, Reliability, Power amplifiers, Microwave equipment, Radiofrequency generators.

An experimental model of alignment calibration group OA-2539/MSQ-16 is described. This equipment consists of automatically programmed signal generators, antennas, signal sources, and related equipment. The automatically programmed signal generators are standard commercial generators modified by the addition of servo circuitry and switching logic to perform an automatic calibration of a group of radio receivers over the frequency range 50-11,000 mc. The antennas consist of two groups, one group receiving and the other transmitting. These antennas feature dual polarization and broadband performance over the range 1000 to 11,000 mc. The signal sources are standard commercial test oscillators modified to permit remote on-off and standby-operate switching. (Author)

AD-261 364 Div. 8
(17 Aug 61) OTS price $8.60

Michigan College of Mining and Technology, Houghton.
ANALYSIS OF DIFFRACTION PATTERNS ON THE GROUND CAUSED BY IONOSPHERIC IRREGULARITIES.
Final rept.,
by Donald G. Yerg. June 61, 85p. incl. illus. tables (Scientific rept. no. 2)
(Contract AF 19(604)3867)
(AFCRL-696) Unclassified report

DESCRIPTORS: *Radio signals, *Ionospheric propagation, Measurement, Medium frequency, Statistical distributions, Statistical analysis, *Radio waves, *Ionospheric disturbances, Magnetic fields, *Electromagnetic wave reflections, Correlation techniques, Spectrographic analysis, Fourier analysis, Diurnal variations, Wave transmission, Turbulence, Velocity.

Three receivers forming a triangular array were located adjacent to a transmitter operating at a frequency of 2.33 mc in Mayaguez, Puerto Rico. The signal intensity-time data were made available for analysis. Parameters related to the shape and the motion of the signal pattern on the ground were evaluated. The drift velocity of the ground pattern and a departure velocity, which is a measure of the random motions, were obtained. A total of 341 records were studied. The statistical distributions of all the data parameters are summarized. Daily and seasonal variations are considered. Spectral analyses of the signal intensity and of the departure speeds were derived. A study of the data suggests that the signal fluctuations are essentially random and may be related to columns of ionization drifting over the receiver site. (Author)

AD-261 398 Div. 8
(17 Aug 61) OTS price $1.10

Wyle-Burgoyne Div., Westbury, N. Y.
RADOME MODEL 128B10005.
Altitude cycling test rept.
22 Nov 60, 6p. incl. illus. table (Rept. no. 1132)
(Subcontract to Grumman Aircraft Engineering Corp., Bethpage, N. Y., Contract NOa(s) 59-0259-c)
Unclassified report

DESCRIPTORS: *Attack bombers, *Naval aircraft, Jet planes, *Radomes, Tests, Test methods, Test equipment, Altitude chambers, Load distribution, Measurement, Moisture, Temperature, Electrostatic capacitance, Electrical properties, *Jet bombers.

The test program was conducted to determine conformance of the A2F radome to the altitude cycling test requirements. The Radome was weighed prior to being installed in the altitude chamber. The total weight was 182 pounds. The Radome was weighed after the altitude cycling. The total weight increased one pound. Capacitant checks were made prior to and after the altitude cycling test. These results indicated the radome to be satisfactory. (Author)

AD-261 414 Div. 8, 25
(17 Aug 61) OTS price $1.60

Trinity Coll., Dublin (Eire).
EMISSION OF SECONDARY ELECTRONS FROM SOLID SURFACES.
Final technical rept. 1 Nov 58-30 Apr 61.
17 July 61, 12p. incl. illus.
(Contract DA 91-591-EUC-973)
Unclassified report

DESCRIPTORS: *Secondary emission, *Electrons, Surfaces, Solids, Solid state physics, Vacuum systems, *Vacuum apparatus, Instrumentation.

Continuing difficulties in the supply of ultra-high vacuum equipment have to date prevented the attainment of the low pressures necessary for the measurements in this research. A summary of the pumping systems used or considered is given. (Author)

AD-261 442 Div. 8
(17 Aug 61) OTS price $3.60

Hughes Aircraft Co., Newport Beach, Calif.
HIGH FREQUENCY TRANSISTOR STUDY.
Interim engineering rept. no. 1, 10 Mar-30 June 61,
by W. P. Waters and R. Zuleeg. 28 July 61, 40p. incl. illus.
(Contract NObsr-85296)

Unclassified report

DESCRIPTORS: *Transistors, Superhigh frequency, *Transistor amplifiers, *Microwave amplifiers, Amplifiers, Crystal mixers, Frequency multipliers, Microwave oscillators, Oscillators, Electronic circuits, Packaging, Packaged circuits, Negative resistance circuits, Design, Measurement, *Radiofrequency generators, Microwave equipment.

The research and development program is designed to investigate transistor design parameters and circuit requirements which determine and/or influence the parametric mode of transistor operation and to determine the feasibility of developing an amplifier, mixer, or harmonic generator operating with high stable gain and low noise at frequencies within the region of 4 to 10 kmc. A new transistor structure was designed which will be capable of operation at a fundamental frequency above 1,000 mc. Used in conjunction with a coaxial package structure designed for microwave frequencies, the transistor leads can be made sufficiently short to bring the self-resonance of the assembly above the fundamental frequency of oscillation of the transistor. Measurements are reported on present transistors from which the lead inductances of the TO-5 encapsulation are calculated as 3-6nH. Analysis is given which indicates negative resistance oscillation should be possible for a frequency range where alpha has a phase shift between pi and pi radians. Evaluation of present transistors verified the presence of this negative resistance oscillation at 1-1.5 kmc. Coaxial mixer circuits were constructed, using a coaxial transistor. Insertion loss reduction was achieved at 2 kmc. (Author)

AD-261 446 Div. 8, 25
(18 Aug 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
CW SEMICONDUCTOR MASER POSSIBLE.
11 July 61, 2p. (AID rept. 61-105; Trans. from Utilization of Indirect Transitions in Semiconductors to Achieve States with Negative Absorption Coefficients; Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki 40:1203-1209, Apr 61)

Unclassified report

DESCRIPTORS: Technological intelligence, USSR, *Semiconductors, *Microwave amplifiers, Electron transitions, Phonons, Photons, Absorption, Amplifiers.

AD-261 450 Div. 8
(18 Aug 61) OTS price $1.10

Science and Tech. Section, Air Information Div. Washington, D. C.
TWT FREQUENCY DIVIDER.
25 July 61, 2p. (AID rept. 61-112; Trans. from Frequency Division on Superhigh Frequencies Through the Use of Traveling-Wave Tubes; Izvestiya Vysshikh Uchebnykh Zavedeniy. Radiofizika 4:309-318, 1961)

Unclassified report

DESCRIPTORS: Technological intelligence, USSR, Electron tubes, *Traveling wave tubes, Superhigh frequency, *Frequency dividers, Helixes, Design.

A traveling-wave tube with separate helixes is suggested for use in SHF frequency dividers. The purpose of the experiments was to evaluate the utility of traveling-wave tubes with separate helixes for frequency division in the SHF range. Systems employing TWT with separate helixes are also considered applicable for designing SHF dividers based on n-order resonance and locking on harmonics. Some results are described with second-order resonance in the system where the first helix introduces a 6000-mc signal into the electron beam and the second helix is used as a delay system of a TWT oscillator with external feedback and is tuned to 3000 mc. (Author)

AD-261 458 Div. 8, 30, 25
(18 Aug 61) OTS price $3.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
SOME MICROWAVE PROPAGATION EXPERIMENTS PERFORMED IN A HYPERVELOCITY WIND TUNNEL.
Rept. on Ion Sheath Research,
by J. Q. Burgess. 29 June 61, 31p. incl. illus. tables (Rept. no. 1021-2)
(Contract AF 33(616)6782)

Unclassified report

DESCRIPTORS: *Microwaves, Propagation, *Hypersonic wind tunnels, Test methods, Tests, Measurement, *Plasma physics, *Atmosphere entry, Simulation, Gas ionization, Noise (Radio), Microwave networks, Polarization, Phase measurement, X Band, K Band, S Band, *Guided missile noses, Microwave equipment, Data processing systems, Telemetering data, *Radio transmission, *Re-entry aerodynamics.

The re-entry of a missile into the atmosphere at high speed creates a thermally generated plasma around the nose of the missile. This plasma has been found to produce a severe loss in transmission to the extent that 220-mc telemetry data are made unreliable.. There is some hope that this problem can be alleviated by going to higher frequencies where the energy absorbed by the plasma is minimized. The experimental techniques used in the study of this problem are described. (Author)

AD-261 496 Div. 8, 6
(17 Aug 61) OTS price $2.60

Grumman Aircraft Engineering Corp., Bethpage, N. Y.
DATA REDUCTION ON RADOME MODEL 128B10005-3. SERIAL NO. 2,
by W. P. Guarino. 8 Mar 60, 18p. incl. tables.
(Brunswick Corp. rept. no. GRU 3-2)
Unclassified report

DESCRIPTORS: *Radomes, *Naval aircraft, Tests, Electronic equipment, Aircraft equipment, Airborne, Microwaves, *Attack bombers, *Jet planes, Antenna radiation patterns, Electromagnetic properties, Dielectric properties, *Radar antennas.

9. FLUID MECHANICS

AD-260 911 Div. 9
(9 Aug 61) OTS price $9.60

James Forrestal Research Center, Princeton, N. J.
A STUDY OF THE LEADING EDGE OF A SHOCK INDUCED BOUNDARY LAYER,
by Martin Sichel. Mar 61, 115p. incl. illus. tables, 27 refs. (Rept. no. 540)
(Contract AF 49(638)465, Proj. 9781)
(AFOSR-628) Unclassified report

DESCRIPTORS: *Aerodynamics, Supersonics, *Shock waves, Sheets, *Boundary layer, Mathematical analysis, Integral equations, Differential equations, Partial differential equations, Shock tubes, *Hypersonics, Viscosity.

An investigation of the flow at the leading edge of the boundary layer generated by a weak shock wave moving past a flat plate is presented. It is postulated that the leading edge flow can be divided into a shear layer near the wall dominated by the transverse viscous shear and into a free stream or shock region outside the shear layer which is dominated by the longitudinal viscous stress. By expanding flow parameters in the shock strength parameter and by stretching coordinates, simplified equations for the shear layer and the shock region were derived from the Navier-Stokes or continuum equations. Such a shock strength expansion was also applied to the normal shock in the free stream and the results were found to be excellent agreement with exact analytical solutions of the Navier-Stokes equations. The vertical velocity generated within the shear layer is of sufficient magnitude to affect the shock region flow; therefore, the two regions interact. Outside the shear layer there is a region of non-Hugoniot flow where the shock is not normal or oblique but where the shock structure is two-dimensional. An approximate solution of the leading edge interaction was obtained by replacing the shock region with an oblique shock, which is approximately matched to the shear layer. (Author)

AD-260 932 Div. 9
(9 Aug 61) OTS price $3.60

Southwest Research Inst., San Antonio, Tex.
AN ANALYSIS OF FLUTTER IN OSEEN-TYPE VISCOUS FLOW,
by Wen-Hwa Chu. 15 May 61, 37p. incl. tables, 12 refs. (Technical rept. no. 1)
(Contract Nonr-333500)
Unclassified report

DESCRIPTORS: Viscosity, Sheets, *Fluid flow, *Flutter, Aerodynamics, Hydrodynamics, Airfoils, Hydrofoils, Boundary layer, Wake, Differential equations, Potential theory, Reynolds number, Lift, Moments, Mathematical analysis.

Unsteady Oseen flow equations are employed to obtain a linearized solution based on a discontinuous wake model. Results are applied to large Reynolds number for estimation of the viscous correction on unsteady lift and moment. If the asymptotic solution is not too slowly convergent, the correction is of the order of the ratio of the logarithm of Reynolds number to the Reynolds number, which is negligible. It shows that the generalized trailing edge condition is reasonable and might predict the essential correction in real fluid. (Author)

AD-260 934 Div. 9, 25
(9 Aug 61) OTS price $5.60

Technical Operations, Inc., Burlington, Mass.
DESIGN, DEVELOPMENT AND CONSTRUCTION OF A FLUID ACOUSTIC FILTER.
Final rept.,
by A. W. Starbird. Mar 60, 53p. incl. illus.
(Rept. no. TO-B 60-9)
(Contract NObs-72330)
Unclassified report

DESCRIPTORS: *Acoustic filters, Design, *Fluid flow, *Fluid mechanics, *Noise, Test equipment, Hydrophones, Test methods, Attenuation, Measurement, Tests.

Various devices employed to attenuate noise borne by flowing gas were evaluated as attenuators of noise borne by flowing water. Experiment indicates that expansion chambers offer higher attenuations of fluid-borne sound, at least across the important 20-1000 c band width, than gas theory would predict. We believe that further experimentation will disclose that the dynamics of flow within and through an expansion chamber, not acknowledged by the gas theory, can be controlled to provide even greater and broader-band attenuations than those obtained in the experiments reported herein. For this reason, and because expansion chambers inherently are more compact, less costly, and require less maintenance than the other devices considered, we recommend that their development be pursued. (Author)

AD-260 990 Div. 9
(10 Aug 61) OTS price $6.60

Fairchild Aircraft and Missiles Div., Fairchild Engine and Aircraft Corp., Hagerstown, Md.
ANALYSIS OF A.E.L. NOZZLE TESTS.
9 June 61, 60p. incl. illus. tables (Rept. no. R243-008)
Unclassified report

DESCRIPTORS: *Nozzles, Jets, Flaps, Wings, *Aerodynamics, Tests, Thrust, Pressure, Mathematical analysis, Integral equations, Algebra, Differential equations, Partial differential equations, Tests, Test facilities.

The data from cold flow tests of two jet flap nozzles is analyzed. These tests were conducted in an altitude chamber. Airflow, the Mach numbers in the inlet and at the slot, the nozzle thrust distribution, discharge coefficient, and pressure loss coefficient are derived in the analysis. (Author)

Division 9 - FLUID MECHANICS

AD-261 033 Div. 9, 1, 31
(10 Aug 61) OTS price $1.50

David Taylor Model Basin, Washington, D. C.
DESIGN STUDY OF A 29-FOOT GEM,
by Harvey R. Chaplin. Apr 61, 53p. incl. illus.
(Rept. no. 1521; Aero rept. no. 999)
Unclassified report

DESCRIPTORS: *Naval vessels, *Ground effect, Machines, Design, Stability, Stability (Longitudinal), Stability (Lateral), Variable pitch propellers, Shrouded propellers, Crash rescue boats, Mathematical analysis, *Flying platforms, Control, Speedboats.

A design study was carried out for a GEM based on a set of nominal specifications including: a 3-ft operating height, a 1200-lb payload, and an 80-knot speed. Preliminary examination of requirements leads to selection of a very lightly loaded 29-ft-effective-diameter planform, with a gross weight slightly over five tons. Performance calculations are carried out for both fixed and variable tangential deflection, for a single-fan and for a twin-fan design. Performance improves as the complexity of the design increases, but the simplest design (single-fan configuration with fixed deflection) requires only about 25% more power than the best design (twin-fan configuration with variable deflection). For this simple design, the problems of matching fan and engine are worked out, grade-climbing calculations are made, static longitudinal and lateral stability and dynamic lateral stability are calculated, the control problem is examined, and calculations for the turning maneuver are made. (Author)

AD-261 054 Div. 9, 8
(11 Aug 61) OTS price $9.60

Cornell U. Graduate School of Aeronautical Engineering, Ithaca, N. Y.
MAGNETOGASDYNAMIC CONE FLOW FOR THE SPECIAL CASE OF INFINITE CONDUCTIVITY AND ALIGNED FIELDS,
by Jerome J. Brainerd. 1960, 106p. incl. illus. tables, 26 refs.
(Contract Nonr-40125)
Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, Aerodynamic configurations, *Conical bodies, Dissociation, Gas ionization, Electromagnetic fields, Shock waves.

The problem of steady, inviscid, magnetogasdynamic flow past an unyawed infinite cone is studied for the special case of an applied magnetic field aligned with the free stream. Two special cases are considered, the conductivity of the gas ahead of the shock wave having a value of zero and a value of infinity. In both cases, the conductivity of the gas between the shock wave and the cone is assumed to be infinite, and it is assumed there are no currents ahead of the shock wave. When these two assumptions are satisfied, the two cases are the same. Solutions to the problem are found for two distinct flow regimes, using an incompressible approximation to the flow between the shock and the body. The first flow regime is a modification of the ordinary gasdynamic flow, and occurs for supersonic and superalfvenic freestream conditions. The second flow regime is essentially different from the ordinary gasdynamic flow, being characterized by a forward-facing shock wave, and occurs for subsonic and subalfvenic freestream conditions, but with the restriction that the sum of M squared plus A squared exceeds unity, where M and A are the Mach number and Alfven number, respectively, of the flow. (Author)

AD-261 055 Div. 9, 25
(11 Aug 61) OTS price $5.60

Cornell U. Graduate School of Aeronautical Engineering, Ithaca, N. Y.
MEASUREMENT OF THE DISSOCIATION RATES OF HYDROGEN AND DEUTERIUM,
by Emmett A. Sutton. 1960, 50p. incl. illus. tables.
(Contract Nonr-40125)
Unclassified report

DESCRIPTORS: *Dissociation, *Hydrogen, *Deuterium, *Shock waves, Isotopes, Molecules, Atoms, High temperature research, Gases, Argon, Interferometers, Rotating drum cameras, Mixtures.

Using an interferometer and drum camera to measure the density ratio behind an incident shock wave in mixtures of argon and hydrogen, the dissociation rates for two isotopes of hydrogen have been measured. Sufficient data were obtained to measure the rate constants for the reaction in a temperature range from 2800 K to 4500 K. The relative efficiencies of argon, the hydrogen molecule, and the hydrogen atom in dissociating hydrogen have been found for each isotope. The rate constants for the hydrogen molecule and the argon atom as third bodies for association were found to have a simple 1/T dependence. The rate constants for the collision of three atoms causing association were found to be much larger than the other rate constants and to have a more involved temperature dependence. The rate constant for the association of hydrogen where the third body is a hydrogen atom shows a marked change in its rate of decrease at about 3400 K. (Author)

AD-261 073 Div. 9
(11 Aug 61) OTS price $2.60

General Dynamics/Convair, San Diego, Calif.
AN APPROXIMATE THEORY FOR TURBULENT WAKES BEHIND HYPERSONIC BLUNT BODIES,
by W. W. Short. Apr 61, 19p. incl. illus.
(Rept. no. ZPh-107)
(Contract DA 04-495-ORD-3112)
(ARPA Order no. 39-59, Task 2)
Unclassified report

DESCRIPTORS: *Blunt bodies, *Turbulence, *Wake, *Hypersonic flow, Hypersonic test vehicles, Fluid flow, Fluid mechanics, Enthalpy, Thermodynamics, Velocity, Temperature, Jet mixing flow, Mathematical analysis, Integral equations.

The growth of the turbulent core in the constant pressure wake, of a blunt hypersonic body is predicted by means of a mixing length theory. Near the body where the core is smaller than the enthalpy wake the constant density theory of Townsend is applied. A variable density solution is obtained for the region in which the core and enthalpy wake are of the same size. The two solutions are fitted to predict velocities, temperatures, and concentrations in the constant pressure region for several thousand body diameters behind the missile. (Author)

AD-261 104 Div. 9, 1, 2
(11 Aug 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
TABLES OF AIRSPEED, ALTITUDE, AND MACH NUMBER BASED ON LATEST INTERNATIONAL VALUES FOR ATMOS-

PHERIC PROPERTIES AND PHYSICAL CONSTANTS,
by Sadie P. Livingston and William Gracey, Aug 61, 37p. incl. tables, 13 refs. (NASA Technical note D-822)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-822.

DESCRIPTORS: *Aeronautics, Atmosphere, High altitude, Altimeters, *Air speed, *Mach number, *Tables, Barometric pressure, Supersonics, Transonics.

Pressure-airspeed tables based on the latest established value for the nautical mile and the physical constants and atmospheric properties adopted for the International Civil Aviation Organization (ICAO) standard atmosphere are presented. Impact pressures are given for airspeeds up to 1,000 knots and 1,100 miles per hour. Pressure-altitude tables are given for altitudes up to 100,000 geopotential feet. Mach number in terms of the ratio of impact pressure to free-stream static pressure for Mach numbers from 0.10 to 5.00 are given. True airspeeds are tabulated for calibrated airspeeds from 100 to 1,000 knots and for altitudes from 0 to 100,000 geopotential feet. (Author)

AD-261 117 Div. 9
(11 Aug 61) OTS price $4.60

Convair Scientific Research Lab., San Diego, Calif.
THE COMPRESSIBLE TURBULENT BOUNDARY LAYER ON A FLAT-PLATE WITH TRANSPIRATION COOLING. I. MEASUREMENTS OF HEAT TRANSFER AND BOUNDARY LAYER PROFILES,
by E. Roy Bartle and Bernard M. Leadon. May 61, 42p. incl. illus. tables (Research rept. no. 11)
Unclassified report

DESCRIPTORS: *Turbulent boundary layer, *Sweat cooling, Boundary layer, Heat transfer, Measurement, Compressible flow, Sheets, Mach number, Wind tunnels, Drag, Shear stresses, Injection, Nitrogen, Aerodynamics.

Measurements of heat transfer coefficients and recovery factors at Mach Numbers 2 and 3.2 on a porous flat plate with gaseous nitrogen injection are reported. It is found that the temperature difference ratio is largely insensitive to Mach and Reynolds Numbers when the proper injection parameter is used. Mach Number and velocity profiles through the boundary layer are tabulated for future analysis. (Author)

AD-261 152 Div. 9
(14 Aug 61) OTS price $5.60

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
THE RAYLEIGH PROBLEM FOR A DISSOCIATED GAS,
by F. K. Moore and W. J. Rae. June 61, 51p. incl illus. 13 refs. (Rept. no. AF-1285-A-8)
(Contract Nonr-265300, Proj. NR-061-106)
Unclassified report

DESCRIPTORS: *Hypersonic flow, *Superaerodynamics, *Dissociation, Gas flow, Boundary layer, *Heat transfer, Surface temperature, Sheets, Enthalpy, Partial differential equations, Integration, Thermodynamics.

Rayleigh problems, in which dissociation kinetics are of significant effect, are analyzed, having in mind possible analogies to hypersonic boundary layers with chemical nonequilibrium. The gas is imagined to be partly dissociated, initially in equilibrium, and bounded by a surface of some given degree of catalytic efficiency at the same temperature, and at rest. Then, a small change is specified to occur impulsively at the surface. The consequences of one such change, a surface temperature jump, are reviewed. Then, the problem of impulsive plate motion is treated, wherein viscous dissipation drives the gas out of chemical equilibrium, the wall temperature being held at its original level. Certain implications of the study are discussed in reference to the theoretical and experimental study of hypersonic nonequilibrium boundary layers. (Author)

AD-261 175 Div. 9, 12
(14 Aug 61) OTS price $4.60

Applied Physics Lab., Johns Hopkins U., Silver Spring, Md.
FLOW AROUND A SQUARE BODY WITH A PYRAMIDAL-TYPE NOSE AT ANGLE OF ATTACK AND A MACH NUMBER OF 1.73,
by Daniel E. Harrison. Jan 61, 35p. incl. illus. (Bumblebee rept. no. 301)
(Contract NOrd-7386)
Unclassified report

DESCRIPTORS: Hypersonic flow, *Supersonic flow, *Guided missile noses, *Aerodynamic configurations Blunt bodies, Supersonic wind tunnels, Partial differential equations, Integral equations, Tests, Pressure, Lift, Pitch.

The normal-force and pitching-moment coefficients of a square body with a pyramidal-type nose are determined by two approximate methods at a Mach number of 1.73. The coefficients are compared with the experimental normal-force and pitching-moment coefficients obtained from wind tunnel tests. The pressure distributions along and around the nose section are first calculated by a linearized method, which is based on the superposition of elementary conical flows due to line sources. The second approximate method for determining the nose pressure distribution is based on the second order shock-expansion method, which uses a corrective procedure that includes the principle of hypersonic similarity. Pressure distributions along the aft body are evaluated by the second method. (Author)

AD-261 196 Div. 9
(14 Aug 61) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
TRANSITION OF THE LAMINAR BOUNDARY LAYER ON A DELTA WING WITH 74 DEGREE SWEEP IN FREE FLIGHT AT MACH NUMBERS FROM 2.8 TO 5.3,
by Gary T. Chapman. Aug 61, 42p. incl. illus. table (NASA Technical note no. D-1066)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1066.

DESCRIPTORS: *Laminar boundary layer, *Triangular wings, *Transition temperature, Mach number, Reynolds number, Wind tunnels, Wind tunnel models, Control surfaces, Swept wings.

The test were conducted at Mach numbers from 2.8 to 5.3, with model surface temperatures small compared to boundary-layer recovery temperature. The effects of Mach number, unit Reynolds

number, leading-edge diameter, temperature ratio, and angle of attack were investigated in an exploratory fashion. The results were compared to results of wind-tunnel tests of swept wings and to results of free-flight tests for unswept leading edges. (Author)

AD-261 332 Div. 9
(17 Aug 61) OTS price $6.60

Bureau d'Analyse et de Recherche Appliquees (France).
GROUND EFFECT ON AIRFOILS. PHEOELECTRIC ANALOG STUDY OF THEORETICAL FLOWS,
by L. Malavard. Apr 61, 61p. incl. illus. tables, 12 refs.
(Contract DA 91-591-EUC-1397)
Unclassified report

DESCRIPTORS: *Airfoils, *Wings, *Ground effect, Lift, Drag, *Aerodynamics, Pressure, Mathematical analysis, Differential equations, Integral equations, France, Electrolytic cells, Pressure, Fluid flow, Simulation.

Two-dimensional flows around wing airfoils placed in the immediate vicinity of the ground were analyzed theoretically and by means of the rheoelectric analogy with which an exact solution can be obtained. Different methods are described, which make it possible to simulate in an electric tank either the velocity potential or the stream function, or the argument-function, or the logarithmic potential of the flow. Applications to convex-plane airfoils, Clark-Y airfoils with or without blowing, flat plates with flaps, are indicated. The results obtained show that: (1) The lift of airfoils whose lower surface is plane and parallel to the ground generally increased as the distance to the ground became smaller. (2) The effect of a light blowing at the trailing edge is likely, owing to the blocking effect it generates, to improve considerably the lift. (3) The effect of the ground on an airfoil with a downwashed flap is obviously adverse. (Author)

AD-261 358 Div. 9
(17 Aug 61) OTS price $7.60

Midwest Research Inst., Kansas City, Mo.
SUPERSONIC FLUTTER OF AIRFRAMES WITH FLEXIBLE BODIES.
Final rept. 8 Apr 60-7 Apr 61,
by John E. Yates and Edmond F. E. Zeijdel.
24 Apr 61, 70p. incl. illus. tables.
(Contract NOw 60-0726-c)
Unclassified report

DESCRIPTORS: *Airframes, Wing-body configurations, Aerodynamics, *Supersonics, *Flutter, Wings, Elasticity, Mathematical analysis, Integral equations, Differential equations, Partial differential equations, Aerodynamic configurations, Integral transforms.

The slender body velocity potential and generalized forces are derived for circular body midwing configurations of arbitrary planform. The results are applicable to supersonic wing-body combinations undergoing both chordwise and spanwise deformation. In this work, the slender wing-body problem is reduced to a simple body problem whose solution is well known, and to a modified slender wing problem. The latter case is solved by a novel approach based on the circle theorem (or the method of images) and a known solution of the airfoil equation for a double interval. The generalized forces are obtained for an arbitrary number of chordwise modes and two spanwise bending modes. Quasi-slender body theory is applied to derive a higher approximation (larger reduced frequency and fineness ratio) of the velocity potential and generalized forces. In this work, M. T. Landahl's approach for rigid wings is extended to flexible wings. For simplicity, only one spanwise mode is treated, although the number of chordwise modes is arbitrary. The slender body generalized force coefficients are derived explicitly for a cone-cylinder body with delta wing configuration. It is found that the latter depend primarily on two geometric parameters. (Author)

AD-261 368 Div. 9
(17 Aug 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
LOCAL AERODYNAMIC HEAT TRANSFER AND BOUNDARY-LAYER TRANSITION ON ROUGHENED SPHERE-ELLIPSOID BODIES AT MACH NUMBER 3.0,
by William D. Deveikis and Robert W. Walker.
Aug 61, 25p. incl. illus. table (Technical note no. D-907)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA technical note D-907.

DESCRIPTORS: Ellipsoids, Spheres, Turbulence, *Aerodynamics, *Heat transfer, Bodies of revolution, Boundary layer, Mach number, *Supersonics, Supersonic flow, Cooling, *Aerodynamic heating, Instrumentation, Thermocouples, Wind tunnels, Pressure, Reynolds number, Surface properties, Friction.

Experimental heating rates and pressure distributions obtained from aerodynamic heating tests on four steel sphere-ellipsoid bodies with surface roughnesses of 5, 100, and 200 microinches are presented. Free-stream Reynolds numbers, based on model spherical diameter, were 4.25 x 10 to the 6th power and 2.76 x 10 to the 6th power, and the stagnation temperature was 650 F. The tests showed that the combination of surface roughness and boundary-layer cooling tended to promote early transition and nullify the advantages attributable to the blunt shape of the model for reducing local temperatures. (Author)

AD-261 369 Div. 9, 1
(17 Aug 61) OTS price $2.25

National Aeronautics and Space Administration, Washington, D. C.
INVESTIGATION OF INTERFERENCE OF A DEFLECTED JET WITH FREE STREAM AND GROUND ON AERODYNAMIC CHARACTERISTICS OF A SEMISPAN DELTA-WING VTOL MODEL,
by Kenneth P. Spreemann. Aug 61, 93p. incl. illus. (Technical note no. D-915)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-915.

DESCRIPTORS: *Vertical take-off planes, Interference, Deflection, Aerodynamics, *Triangular wings, Wind tunnels, Bodies of revolution, *Jets, Wind tunnel models, Jet mixing flow, *Ground effect, Model tests, Semispan models.

An investigation of the mutual interference effects of the ground, wing, deflected jet

stream, and free stream of a semispan delta-wing VTOL model at zero and low forward speeds has been conducted in the 17-foot test section of the Langley 300-MPH 7- by 10-foot tunnel. Attached to the wing behind the jet were various sets of vanes for deflecting the jet stream to different turning angles. The effect of ground proximity gave the normally expected losses in lift at zero and very low forward speeds (up to about 60 to 80 knots for the assumed wing loading of 100 lb/sq ft); at higher forward speeds ground effects were favorable. At low forward speeds, out of ground effect, the model encountered large losses in lift and large nose-up pitching moments with the model at low angles of attack and the jet deflected 90 degree or 75 degree (the angles required for VTOL performance and very low forward speeds). Rotating the model to higher angles of attack and deflecting the jet back to lower angles eliminated these losses in lift. (Author)

AD-261 370 Div. 9
(17 Aug 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
FLUTTER AT VERY HIGH SPEEDS,
by Harry L. Runyan and Homer G. Morgan. Aug 61, 12p. incl. illus. table (Technical note no. D-942; Supersedes NACA Research Memo. L57D16a, AD-132 673)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-942.

DESCRIPTORS: *Flutter, *Hypersonics, Mach number, Theory, Supersonics, *Airfoils, Aerodynamic heating, Hypersonic flow, Thickness, Elasticity.

A discussion is presented of some of the problems of flutter and aeroelasticity that are or may be important at high speeds. Various theoretical procedures for treating high Mach number flutter are reviewed. Application of two of these methods, namely, the Van Dyke method and piston-theory method, is made to a specific example and compared with linear two- and three-dimensional results. It is shown that the effects of thickness and airfoil shape are destabilizing as compared with linear theory at high Mach number. In order to demonstrate the validity of these large predicted effects, experimental flutter results are shown for two rectangular wings at Mach numbers of 6.86 and 3. The results of nonlinear piston-theory calculations were in good agreement with experiment, whereas the results of using two- and three-dimensional linear theory were not. In addition, some results demonstrating the importance of including camber modes in a flutter analysis are shown, as well as a discussion of one case of flutter due to aerodynamic heating. (Author)

AD-261 371 Div. 9
(16 Aug 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
SUPERSONIC FREE-FLIGHT MEASUREMENT OF HEAT TRANSFER AND TRANSITION ON A 10 DEGREE CONE HAVING A LOW TEMPERATURE RATIO,
by Charles F. Merlet and Charles B. Rumsey. Aug 61, 24p. incl. illus. table (Technical note no. D-951; Supersedes NACA Research Memo. L56L10, AD-122 118)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA technical note D-951.

DESCRIPTORS: *Supersonics, Measurement, *Heat transfer, Supersonic flow, *Conical bodies, Aerodynamics, Boundary layer, Turbulent boundary layer, Reynolds number, Mach number, Instrumentation, Laminar boundary layer, Aerodynamic heating.

Heat-transfer coefficients in the form of Stanton number and boundary-layer transition data are presented for a 100-inch long 10 degree total-angle cone with a 1/16-inch tip radius over a range of Mach numbers from 1.8 to 3.5 and various wall-to-local-stream temperature ratios. The experimental heat-transfer coefficients were in general slightly higher than theoretical values. A maximum transition Reynolds number of 33 x 10 to the 6th power was measured. (Author)

AD-261 372 Div. 9
(16 Aug 61) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
EFFECTS OF CANARD PLANFORM AND WING-LEADING-EDGE MODIFICATION ON LOW-SPEED LONGITUDINAL AERODYNAMIC CHARACTERISTICS OF A CANARD AIRPLANE CONFIGURATION,
by Bernard Spencer, Jr. Aug 61, 49p. incl. illus. 11 refs. (NASA Technical note no. D-958)
Unclassified report

Also available from NASA, Wash. 25., D. C., as NASA Technical note D-958,

DESCRIPTORS: Aerodynamic configurations, *Canard configuration, Wings, *Aerodynamics, Pitch, Moments, Lift, Drag, *Triangular wings, Stability (Longitudinal), Model tests.

An investigation at low subsonic speeds has been conducted in the Langley 300-mph 7- by 10-foot tunnel. The basic wing had a trapezoidal planform, an aspect ratio of 3.0, a taper ratio of 0.143, and an unswept 80-percent-chord line. Modifications to the basic wing included deflectable full-span and partial-span leading-edge chord-extensions. A trapezoidal canard similar in planform to the basic wing and a 60 degree swept-back delta canard were tested in conjunction with the wing. The total planform area of each canard was 16 percent of the total basic-wing area. Modifications to these canards included addition of a full-span chord-extension to the trapezoidal planform and a fence to the delta planform. (Author)

AD-261 388 Div. 9
(28 Aug 61) OTS price $1.10

Polytechnic Inst. of Brooklyn, N. Y.
A NOTE ON THE TRANSIENT TEMPERATURE DISTRIBUTION IN AN ORTHOTROPIC SPHERE DUE TO AERODYNAMIC HEATING,
by B. Venkatraman, Sharad A. Patel, and Frederick V. Pohle. Aug 61, 6p. incl. illus. table (PIBAL rept. no. 596)
(Contract Nonr-83923, Proj. NR 064-433)
Unclassified report

DESCRIPTORS: *Spheres, Temperature, *Heat transfer, *Thermal conductivity, Mathematical analysis, Special functions, *Aerodynamic heating, Hypersonic flow, Hemispherical shells, Guided missile noses.

The analysis of the transient temperature distribution in an isotropic sphere has been extended

to a sphere with orthotropic heat conductive properties which are temperature independent. The Bessel functions which appear in the solution are of irregular orders whereas for the isotropic case these were of the order of half an odd integer. The temperature distributions are shown graphically. (Author)

AD-261 457 Div. 9, 12, 31
(18 Aug 61) OTS price $2.60

Allied Research Associates, Inc., Boston, Mass.
LAUNCHING OF AIRBORNE MISSILES UNDERWATER. PART X. TOTAL STATISTICAL MISSILE RESPONSE TO CONFUSED DIRECTIONAL SEAS,
by Theodore R. Goodman and Theodore P. Sargent. 15 Aug 61, 22p. (Document ARA-947)
(Contract Nonr-234300)
Unclassified report

DESCRIPTORS: *Guided missiles, Underwater to air, Launching, Guided missile trajectories, Harmonic analysis, Ocean waves, *Hydrodynamics, Underwater ballistics, Submarines, Roll, Mathematical analysis, Underwater, Integrals, Statistical analysis, Correlation techniques.

In launching an airborne missile from underwater, both the launching submarine and the missile itself respond in a random fashion to the waves of a confused sea. The submarine motion contributes to the trajectory of the missile by imposing a set of random initial conditions on the missile. The resulting missile response, subject to both random forcing functions and random initial conditions, is then determined by employing the technique of generalized harmoonic analysis. The response resulting from the forcing function alone, called the direct response, has been determined previously; the response resulting from the initial conditions alone, called the indirect response, has also been determined. The particular feature of this report is the inclusion of responses resulting from the statistical cross-correlation between direct and indirect responses. It is shown, furthermore, that there is no cross-correlation between the initial conditions resulting from submarine roll and the other wave-induced causes of missile response. (Author)

AD-261 468 Div. 9
(18 Aug 61) OTS price $2.60

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
A KINETIC MODEL FOR HYPERSONIC RAREFIED GAS FLOW,
by Jacob Enoch. Apr 61, 28p. (Rept. no. R61SD063)
(Contract AF 04(647)269)
Unclassified report

DESCRIPTORS: *Hypersonic flow, Gas flow, *Integral equations, Partial differential equations, Equations, *Superaerodynamics, Functions, Kinetic theory.

A kinetic model, which is based on an approximation to the complete Boltzmann equation, is developed for the purpose of solving flow problems in the high velocity ratio rarefied gas regime. The approximation consists of substituting appropriate delta-functions for certain portions of the distribution function wherever they appear in a collision integral. The Boltzmann equation reduces to a first order linear inhomogeneous partial differential equation in this approximation, and the detailed intermolecular differential scattering cross section appears explicitly in the inhomgeneous term. The model is applied to the solution of the hypersonic couette flow of a rarefied hard sphere gas. (Author)

AD-261 480 Div. 9
(18 Aug 61) OTS price $1.60

Polytechnic Inst. of Brooklyn, N. Y.
VELOCITIES IN TWO-DIMENSIONAL ASYMMETRIC WAKES,
by Martin H. Steiger and Martin H. Bloom. July 61, 15p. incl. illus. (PIBAL rept. no. 707)
(Contract AF 49(638)217, Proj. 9781)
(AFOSR-1085) Unclassified report

DESCRIPTORS: Wake, Fluid flow, Fluid mechanics, *Boundary layer, *Integral equations, Viscosity, *Compressible flow, Velocity, Laminar boundary layer.

The fluid mechanics of asymmetric free mixing regions are investigated by an integral method analysis, with emphasis on non-similar behavior stemming from the form of the initial profiles. Velocity distributions are calculated and presented for a steady, laminar, compressible, two-dimensional wake for various values of the inviscid velocity ratio u1/u2, where u is the axial velocity component evaluated at the outer edge of the viscous layer and 1 and 2 refer to the (x1,y) and (x2,y) coordinate systems, respectively. (Author)

AD-261 489 Div. 9, 2
(18 Aug 61) OTS price $1.60

Astrophysical Observatory, Smithsonian Institution, Cambridge, Mass.
THE ATMOSPHERIC DRAG OF ARTIFICIAL SATELLITES DURING THE OCTOBER 1960 AND NOVEMBER 1960 EVENTS. Special rept. no. 62 on Research in Space Science,
by Luigi G. Jacchia. 26 May 61, 13p. incl. illus. table.
(Sponsored by Geophysics Research Directorate, U. S. Air Force, Cambridge and National Aeronautics Space Administration)
Unclassified report

DESCRIPTORS: Satellite vehicles, *Satellite vehicle trajectories, *Orbital flight paths, *Drag, Magnetic effects, *Magnetic storms, Terrestrial magnetism, Acceleration, Tables.

Seven satellites with perigee heights between 206 and 1121 km showed atmospheric-drag perturbations during the geomagnetic disturbances of November 1960. These perturbations closely paralleled the planetary geomagnetic-index curves with no detectable time lag. The amplitudes of the perturbations ranged from a factor of 2 to a factor of 8; they showed a general tendency to increase with height, but little correlation with latitude or position relative to the sun. These results are confirmed by the accelerations of two satellites during the magnetic storm of October 6 and 7, 1960. (Author)

10. FUELS AND COMBUSTION

AD-260 923 Div. 10, 22
(21 Aug 61) OTS price $1.60

Bureau of Mines, Pittsburgh, Pa.
STUDIES ON DEFLAGRATION TO DETONATION IN PROPELLANTS AND EXPLOSIVES.
Quarterly rept. 1 Apr-30 June 61,
by F. C. Gibson, C. R. Summers and F. H. Scott.
30 June 61, 15p. incl. illus.
(ARPA order no. 44-61) Unclassified report

DESCRIPTORS: *Solid rocket propellants, *Propellants, *Explosives, *Detonation, *Combustion, High speed cameras, Rotating mirror cameras, High speed photography, Shock waves, Detonation waves, Pressure, Measurement, Oscilloscope probes, Velocity, Ionization, Propellant grains, Nitro radicals, Methanes, Test equipment.

The application of the Cordin streak camera to the study of the relative position of the luminous zone, the ionization zone, and the compression wave activity during the initiation process in solid propellants was investigated. A transparent glass wafer was placed in the charge for the purpose of forming an image on the camera entrance slit. Two configurations were used: (1) the wafer passed across the entire width of the strand or grain where the luminosity along the wafer surfaces through the wafer; (2) the wafer extended into the axis of the charge. The second method was better as the front luminosity recorded was from the detonation zone; the radial wafer indicated strong shock luminosity ahead of detonation. Development of the pressure-resistance element system for continuous determination of the compression wave position was continued.

AD-261 023 Div. 10
(10 Aug 61) OTS price $1.10

Phillips Petroleum Co., Bartlesville, Okla.
GAS TURBINE AND JET ENGINE FUELS.
Bimonthly progress rept. no. 6,
by W. L. Streets. 9 Nov 60, 4p. incl. illus. table (Research Division rept. no. 2750-60R)
(Contract NOa(s) 60-6009-c)
Unclassified report

DESCRIPTORS: *Jet engine fuels, *Aviation fuels, *Fuel additives, Additives, *Corrosion inhibition, Corrosion research, Corrosion, *Flame holders, *Jet flame holders, Gas turbines, Phosphorus, Phosphates, Cresyl radicals, Sulfur compounds, Fuels, Combustion, Combustion chambers.

A brief study was made of the effect on 2-in. combustor flame tube durability by the addition of two P-containing corrosion inhibitors and tri-cresyl-phosphate to a synthetic 1.0% S base fuel. The corrosion inhibitors used were two commercial additives approved for use in military jet fuels. Tri-cresyl-phosphate was included to provide a P compound of known species. This effort was made to check possibilities of accelerated rates of S corrosion of turbine hot section components when P containing corrosion inhibitors were added to high sulfur jet fuels. Tests showed no accelerated deterioration of flame tubes by any of these 3 materials, with some slight indication of a reduction in flame tube metal loss as a result of the addition of the two commercial inhibitors included in the study. (Author)

AD-261 024 Div. 10
(10 Aug 61) OTS price $1.60

Phillips Petroleum Co., Bartlesville, Okla.
GAS TURBINE AND JET ENGINE FUELS.
Bimonthly progress rept. no. 1,
by W. L. Streets. 6 Apr 61, 12p. incl. illus. tables (Research Division rept. no. 2873-61R)
(Contract NOw 61-0590-d; Continuation of Contract NOa(s) 60-6009-c)
Unclassified report

DESCRIPTORS: *Jet engine fuels, *Aviation fuels, Sea water, *Corrosion, Corrosion research, *Flame holders, *Jet flame holders, Combustion chambers, Gas turbines, Fuels, Combustion.

Initiation of this study has been brought about as a result of reports of markedly decreased life of jet engine hot section components in engines operating on S-containing fuels in sea water laden atmospheres. Results of testing carried on to date in this laboratory have indicated the following: Synthetic sea water (ASTM D655) showed no significant tendency to increase or decrease flame tube metal loss above or below the values observed for operation on 1% S fuel without sea water injection, even at concentrations as high as 5000 times that indicated in the literature as representative of the concentration of airborne sea water vapor at an altitude of 50 ft over the ocean. Natural sea water (Gulf of Mexico) did cause increased metal loss both with operation on 1% S fuel and with nearly S-free fuel. However, the magnitude of these increases was nearly the same without S as with S, indicating that the corrosive effects of S and this particular sea water were not synergistic but independent. (Author)

AD-261 026 Div. 10, 25
(10 Aug 61) OTS price $1.60

Rocket Power, Inc., Pasadena, Calif.
THERMODYNAMICS OF REACTIONS INVOLVING LIGHT METAL OXIDES AND PROPELLANT GASES.
Quarterly rept. no. 4, 9 Feb-9 May 61,
by M. Farber, J. W. Davis and others. 9 May 61, 14p. incl. illus. tables, 12 refs. (Rept. no. QR-1987-4)
(Contract DA 04-495-ORD-1987)
(ARPA Order no. 40-60) Unclassified report

DESCRIPTORS: *Solid rocket propellants, *Combustion chamber gases, *Boron compounds, Oxides, Fluorides, *Oxyfluorides, Gases, Liquids, Heat of formation, Thermochemistry, Thermodynamics, *Reaction kinetics, Chemical reactions, Aluminum compounds.

Employing a new experimental technique, molecular flow reaction studies, a heat of formation (H sub f298K) of - 142 + or - 3 kcal/mole is reported for the molecule BOF(g). The reaction B2O3(1) + BF3(g) equals (BOF)3(g) was employed for this study. Earlier transpiration studies yielded values for H sub f298K of - 567.8 + or - 0.5 kcal/mole and S sub 298K of 89.9 + or - 2 cal/degrees/mole for the trimer BOF3(g). (Author)

AD-261 347 Div. 10, 30
(17 Aug 61) OTS price $1.60

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
AN ADIABATIC SELF-HEATING APPARATUS FOR DETERMINING THE KINETIC PARAMETERS OF THE ROCKET

PROPELLANT DECOMPOSITION PROCESS,
by Edward T. Smith and Rodolph W. Velicky.
June 61, 8p. incl. illus, table (Technical note no. FRL TN 36)
(Proj. OMS-5010.11.585)

Unclassified report

DESCRIPTORS: *Solid rocket propellants, Test equipment, *Combustion, *Decomposition, Test methods, Nitrocellulose, Storage, Reaction kinetics, Thermochemistry, Simulation, Vapors, Propellant grains, Detonation.

An adiabatic, self-heating apparatus was assembled for determining the kinetic parameters of the propellant decomposition process, for purposes of predicting critical diameter, at a given temperature; or time to deflagration for various regular shapes, at a given temperature in storage. A modified Parr bomb was used to contain the test sample, providing for constant-volume operation, with the decomposition products constrained to remain in the vicinity of the propellant grain. The activation energy and heat generation coefficient were determined for a typical composite Nitrocellulose-base propellant. The results obtained here indicate that this apparatus is appropriate to the study of the kinetic parameters in solid propellant decomposition. (Author)

AD-261 448 Div. 10
(18 Aug 61) OTS price $1.10

Science and Tech. Section, Air Information Div.
Washington, D. C.
THERMAL STABILITY OF JET FUELS.
17 July 61, 4p. (AID rept. 61-107)

Unclassified report

DESCRIPTORS: *Jet engine fuels, *Aviation fuels, Contamination, Chemical impurities, High temperature research, *Thiols, Sulfur compounds, Bronze, Brass, Corrosion, Deterioration, Catalysts, Catalysis, Test methods, Sedimentation, USSR, Stability.

A study of the effect of mercaptans on the formation of insoluble sediment in jet fuels at elevated temperatures is reported. The study was conducted in three experimental series. Series 1 involved the testing of TC-1 fuels to determine the temperature of maximum sediment formation. Series 2 dealt with the effects of mercaptans and catalytic metals on sediment formation at 150 C. Series 3 extended the experiments of series 2 to the 100-300 C range. Sediment formation increased with increasing mercaptan content, and the temperature of maximum sediment formation was 150 C. (Author)

11. GROUND TRANSPORTATION EQUIPMENT

AD-260 807 Div. 11
(9 Aug 61) OTS price $10.10

Ingersoll Kalamazoo Div., Borg-Warner Corp., Mich.
AIROLL VEHICLE LOCOMOTION STUDY.
Final technical rept. on Phases 2, 3 and 4.
1960, 112p. incl. illus. tables.
(Contract Nonr-245900)

Unclassified report

DESCRIPTORS: *Tracked vehicles, Feasibility studies, Design, Tests, Test equipment, Vehicle tracks, Vehicle wheels, Tires, Trafficability, Maneuverability.

The Airoll test platform equipped with (1) 24x24x6 terra tires, (2) 16x24x6 terra tires, and (3) 23x8x10 industrial tires was tested for rolling resistance, ride characteristics, drawbar pull, and power requirement. With the aid of floatation devices, it was driven over water and through bogs to demonstrate its capability as an amphibious vehicle. Incomplete data were obtained from tests to determine the feasibility of using the Airoll principle as a prime mover. The Airoll principle of locomotion was successfully demonstrated and can provide future vehicles with additional mobility potential if properly exploited. Fundamental to all its possible uses is the underlying advantage that ensures optimum mobility during all operating conditions. A high rate of speed is possible over improved roads and the extent of the various off-road operations exceeds that of any other known vehicle. Its inherent buoyancy makes it adaptable to bog-lands, snow, sand, and mud.

AD-260 808 Div. 11
(9 Aug 61) OTS price $4.60

Ingersoll Kalamazoo Div., Borg-Warner Corp., Mich.
AIROLL VEHICLE LOCOMOTION STUDY.
Interim rept. no. 1.
Apr 60, 41p. incl. illus. tables.
(Contract Nonr-245900)

Unclassified report

DESCRIPTORS: *Tracked vehicles, Feasibility studies, Design, Tests, Test equipment, Vehicle tracks, Vehicle wheels, Tires.

An Airoll test platform was designed and built to prove the feasibility and practicability of a locomotion concept incorporating 2 or more tracks, each of which is driven by a sprocket or other suitable means. Each track consists of a series of free-running tires or rollers connected to an endless chain or belt. Motion is produced by track tension which causes the vehicle to roll over tires which also act as the suspension system. A test platform was provided with spacers to produce track length-to-width ratios of 1/1 and 1.5/1. Initial tests are being conducted with the 1/1 ratio on 3 track types: (1) 24x24x6 terra tires, smooth tread, 16 tires/track; (2) 16x24x6 terra tires, smooth tread, 19 tires/track; and (3) 23x8.00x10 industrial tires, 2 tires/axle, 32 tires/track. The test platform equipped with 24x24x6 tires had a net weight of 17,500 lb, a longitudinal cg 104 in. forward of the rear drive sprocket center line, a vertical cg 1-5/8 in. below the top of the sponson, and a transverse cg on the longitudinal center line.

AD-260 942 Div. 11
(9 Aug 61) OTS price $9.60

Ingersoll Research Center, Borg-Warner Corp., Des Plaines, Ill.
VEHICLE LOCOMOTION (AIROLL PRINCIPLE) VOLUME I.
Final rept.,

by R. A. Eubanks and T. Arai. 18 Apr 60, 117p. incl. illus. tables (Rept. no. R-3131-10, Vol. 1) (Subcontract to Ingersoll Kalamazoo Div., Borg-Warner Corp., Mich., Contract Nonr-245900)
Unclassified report

DESCRIPTORS: *Vehicles, Trafficability, Maneuverability, Configuration, Mathematical analysis, Load distribution, Tests, Mathematical prediction, Geometry. *Tracked vehicles, Design.

AD-260 943 Div. 11
(9 Aug 61) OTS price $23.50

Ingersoll Research Center, Borg-Warner Corp., Des Plaines, Ill.
VEHICLE LOCOMOTION. VOLUME II. EXPERIMENTAL AND ANALYTICAL RESULTS.
18 Apr 60, 485p. incl. illus. tables (Rept. no. R-3131-10, vol. 2, Suppl. to Rept. no. R-3131-10, vol. 1, AD-260 942)
(Subcontract to Ingersoll Kalamazoo Div., Borg-Warner Corp., Mich., Contract Nonr-245900)
Unclassified report

DESCRIPTORS: *Vehicles, Trafficability, Tables, Data, Mathematical analysis, *Tracked vehicles, Design, Tests.

AD-260 944 Div. 11
(9 Aug 61) OTS price $8.10

Ingersoll Kalamazoo Div., Borg-Warner Corp., Mich.
AIROLL VEHICLE CONFIGURATION STUDIES (VOLUME III). Final rept.,
by T. Arai. 1 Nov 60, 85p. (Rept. no. R-3243)
(Contract Nonr-245900)
Unclassified report

DESCRIPTORS: *Tracked vehicles, Design, Analysis, Configuration, Motion, Stability, Analog computers.

The results of an analysis of the response of a vehicle designed according to the Airoll Principle are presented to serve as the basis for the design of any such vehicle. The results include graphs showing the response of two specific vehicles with variations of weight distribution, speed, tire pressure, and slope of the front and rear sections of the hull. Of these parameters, the position of the center of gravity (determined from the weight distribution) is shown to primarily affect the stability of motion of any given vehicle. Both vehicles are found to be less stable or more unstable at higher velocities. (Author)

AD-261 127 Div. 11
(14 Aug 61) OTS price $1.60

Continental Army Command, Fort Monroe, Va.
SERVICE TEST OF DRIVING SHIELDS FOR CARRIER, PERSONNEL, ARMORED, FULL-TRACKED M113.
3 Aug 61, 20p. incl. illus.
Unclassified report

DESCRIPTORS: *Windshields, Tests, Climatic factors, Armored vehicles, Tracked vehicles.

This report includes:
Army Armor Board, Fort Knox, Ky.
SERVICE TEST OF DRIVING SHIELDS FOR CARRIER, PERSONNEL, ARMORED, FULL-TRACKED M113. 16 June 61, 5p. illus. (Proj. no. 2130)

Army Arctic Test Board, Fort Greely, Alaska.
SERVICE TEST OF DRIVING SHIELDS FOR CARRIER, PERSONNEL, ARMORED, FULL-TRACKED, M113. 9 June 61, 6p. illus. tables (Proj. no. ATB 2-341)

A service test of driving shields for carrier, personnel, armored, full-tracked, M113 was made to determine the suitability of the test items for Army use under temperate conditons. The test items are for the driver and vehicle commander of the M113 armored personnel carrier. The two shields are similar. Each consists of several rectangular clear plastic windows flanked by a 90 degree circular sector plastic window on each end. The windows are fixed in a framework of plastic coated fabric. Sandwiched in the fabric and surrounding each window is a framework of stiff helical springs. The driver's shield is attached to the vehicle by hook plates on one surface of the shield which attach to periscope guards and by a strap on the other surface which goes around the hatch ring. The commander's shield is attached by hood plates to periscope guards. It was concluded that the driver's and commander's shields are suitable for Army use under temperate climatic conditions. (Author)

AD-261 132 Div. 11
(14 Aug 61) OTS price $2.60

Continental Army Command, Fort Monroe, Va.
APPROVED MILITARY CHARACTERISTICS FOR TRUCK, CARGO, 5-TON.
10 Aug 61, 11p.
Unclassified report

DESCRIPTORS: *Cargo vehicles, Military requirements, Tests, Design, Specifications, Human engineering.

12. GUIDED MISSILES

AD-260 902 Div. 12, 25
(28 July 61) OTS price $2.60

Aerospace Corp., El Segundo, Calif.
THE REFLECTED RADIATION RECEIVED BY AN EARTH SATELLITE,
by E. Levin. 8 May 61, 21p. incl. illus. (Rept. no. TDR-594(1560-01)TN-3)
(Contract AF 04(647)594)
Unclassified report

DESCRIPTORS: *Satellite vehicles, Temperature control, Electric power production, Sources, *Solar energy, Solar cells, *Reflection, Mathematical analysis, Integration, Orbital flight paths, Algebraic geometry, Earth.

Satellite design problems involving temperature control, electrical power available from solar cells and possibly path perturbations of balloon-type satellites lead to consideration of solar radiant energy. This analysis examines in detail

the relative contribution of radiation reflected from the earth and received by the satellite compared to the direct incident solar radiation. The principal component of the reflected radiation (on a spherical satellite) is in the radial direction. This component diminishes to about 10% of the magnitude of the direct radiation at an altitude of about one earth radius. Components other than in the radial direction may generally be neglected. (Author)

AD-260 955 Div. 12, 25, 9, 5, 28
(10 Aug 61) OTS price $3.00

Bolt, Beranek, and Newman, Cambridge, Mass.
METHODS OF SPACE VEHICLE NOISE PREDICTION.
Rept. on Dynamic Problems in Flight Vehicles, by Peter A. Franken. Sep 60, 164p. incl. illus. tables, 60 refs.
(Contract AF 33(616)6217, Proj. 1370)
(WADC TR 58-343, vol. 2) Unclassified report

DESCRIPTORS: *Spaceships, *Noise, *Acoustics, Airframes, Mathematical analysis, Rocket motors, Shock, Sheets, Atmosphere, Turbulence, Oscillation, Sound transmission, Cylindrical bodies, Boundary layer, Aerodynamics, Meteorites, Damping, Human engineering, Launching, Supersonics, Turbulent boundary layer, Radio communication systems, Voice communication systems, Manned, *Satellite vehicles, Rocket motor noise, Speech, Intelligibility, Wake, Mathematical prediction.

Possible sources of noise in space vehicles are reviewed. Information is summarized describing the various fluctuating pressure fields that may exist at the vehicle exterior. The response of the vehicle structure to these pressure fields and the resulting radiation of noise to the internal spaces are studied analytically. The need for new theoretical and experimental knowledge in specific areas is emphasized. The effects of rocket engine noise on communication and hearing are considered in detail. General comments are made concerning vehicle and equipment design for noise control. (Author)

AD-261 041 Div. 12, 1, 9
(10 Aug 61) OTS price $15.50

Boeing Airplane Co., Seattle, Wash.
THE DYNAMIC RESPONSE OF ADVANCED VEHICLES.
Rept. on Dynamic Problems in Flight Vehicles, by Q. R. Bohne, B. E. Clingan and others. Sep 60, 230p. incl. illus. tables, 194 refs.
(Contract AF 33(616)6597, Proj. 1370)
(WADD TR 60-518) Unclassified report

DESCRIPTORS: *Hypervelocity vehicles, *Gliders, Load distribution, Drag, Wings, Gust loads, Earthquakes, Shock, Launching, Booster rockets, Control systems, Airframes, Fuel tanks, Lift, Staging, Re-entry aerodynamics, *Aerodynamics, *Supersonics, *Hypersonics, Airplane landings, Parachutes, Aerodynamic heating, Maneuverability, Mathematical analysis, Differential equations, Matrix algebra, *Dynamics, Digital computers, Analog computers, Vortices, Recovery, Manned, Bibliography.

An analytical study program has been conducted in order to determine dynamic load conditions and governing parameters for the flight of advanced vehicles; and an assessment of the adequacy and the applicability of existing dynamic loads prediction methods has been made. A typical two stage liquid fuel boost-glide configuration is assumed for the study, thus allowing for the interaction of such variables as fuel slosh, structural flexibility, aerodynamic forces and control system forces. The report is divided into sections which discuss dynamic loads in the following areas: pre-launch, boosted flight, staging, re-entry and landing or recovery. Included in the Appendices are discussions of modal determination, simplified methods of analysis, computational techniques, and ground wind criteria. Also included is a development of flight equations of motion and an extensive bibliography of reference material. (Author)

AD-261 080 Div. 12
(11 Aug 61) OTS price $1.60

Bendix Corp., Eatontown, N. J.
PREPARATION OF TECHNICAL DATA PACKAGE WARHEAD SECTION, ATOMIC, TRAINING, XM74 (TYPE X).
Final rept.,
by G. H. Wesp. 1961, 7p.
(Contract DA 30-069-ORD-3210)
Unclassified report

DESCRIPTORS: Guided missiles, Surface to air, *Training devices, *Nuclear warheads, *Guided missile warheads, Guided missile launchers, Launching, Guided missile personnel.

Work was completed on the preparation of the technical data package for the warhead section, atomic, training XM-74 (type X). The XM-74 trainer was designed as a handling and checkout trainer for use by launcher level troops responsible for the final assembly, checkout and launching of Nike Hercules missiles. It is designed to train troops in all operations pertaining to the nuclear warhead section of the Hercules missile from component receipt to final checkout on the launcher rail when assembled with two additional training items. These are the inert missile body section with batteries and cables and the inert booster section. The XM-74 trainer consists of eight assemblies: static probe, nose section with fins, warhead section, fairing band, arm plug, safe plug, surface to air plug, and surface to surface plug. Each of these assemblies is briefly described. (Author)

AD-261 102 Div. 12, 30, 2
(11 Aug 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
STRUCTURE AND DESIGN CONSIDERATIONS OF THE VANGUARD SLV-5 MAGNETIC FIELD SATELLITE,
by John T. Shea. Aug 61, 25p. incl. illus. tables (NASA Technical note D-707)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-707.

DESCRIPTORS: *Satellite vehicles, *Magnetic fields, Design, Measurement, Geophysics, *Magnetic storms, Materials, Battery compartments, Electronic equipment, Staging, Storage batteries, Tests, Safety valves, Magnetometers, Sources, *Satellite vehicle research, Temperature, Vibration.

The Vanguard SLV-5 Magnetic Field Satellite was a 13-inch sphere with a 2-7/16-inch diameter cylin-

der extending 17-1/4 inches from the top. A proton precessional magnetometer was the major scientific equipment. An inflatable aluminum foil and mylar sphere 30 inches in diamter provided a secondary experiment on near-space air density measurements. The magnetic field experiment required that all materials in the satellite be non-magnetic, and that the magnetometer sensing head be 20 inches from any metal. The shell and cylinder therefore were made of a fiberglass-epoxy material and the internal compartment of magnesium. The battery compartment was pressurized and vented by a special relief valve to release hydrogen continuously evolved by the Silver Cells. Although the launching was aborted by breakup of the rocket first stage during flight, telemetry records indicate that the entire satellite structure performed well under launch conditions. (Author)

AD-261 105 Div. 12
(11 Aug 61) OTS price $1.75

National Aeronautics and Space Administration, Washington, D. C.
LUNAR TRAJECTORIES,
by Richard J. Weber, Werner M. Pauson, and Richard R. Burley. Aug 61, 67p. incl. illus.
(NASA Technical note no. D-866)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-866.

DESCRIPTORS: *Lunar probes, *Orbital flight paths, Satellite vehicle trajectories, Landing, Launching, Velocity, Azimuth, Geometry, Space navigation, Homing devices, Moon, Position finding, Catalogs.

A catalog of coast paths between the Earth and the Moon is presented, accounting for three-dimensional factors but neglecting multibody effects. Flight times, velocity increments, and launch azimuths are given for various positions of the Moon and various injection points in the northern hemisphere. The distance covered during powered flight is found to have an important effect on the mission energy requirements. The effect of flight-path angle at burnout is studied; nonhorizontal burnout is often advantageous. The effect of launching from an Earth orbit, rather than directly from the surface, is discussed. Because precession may cause an unfavorable orientation of the orbital plane, departure from a permanent space station is usually undesirable. The velocity increment necessary to accomplish lunar landings or takeoffs is computed as a function of the thrust-weight ratio and of the desired landing location. (Author)

AD-261 135 Div. 12, 25, 30, 9
(14 Aug 61) OTS price $1.60

Aerospace Corp., Los Angeles, Calif.
A TECHNIQUE FOR OBTAINING THE VELOCITY-ELECTRICAL CONDUCTIVITY PROFILE.
by A. E. Fuhs. 30 June 61, 14p. incl. illus.
(Rept. no. TDR-594(1215-01)TN-2)
(Contract AF 04(647)594)
Unclassified report

DESCRIPTORS: *Atmosphere entry, *Gas ionization, *Conductivity, Re-entry vehicles, Measurement, Plasma physics, Magnetohydrodynamics, Meters, Air, Ionization, Fourier analysis, Magnetic fields, Tests, Sensitivity, Coils, Test methods, Electrical properties, Mathematical analysis.

The use of a meter of suitable design may make it possible to measure the profile of velocity and electrical conductivity of ionized air flowing over a re-entry vehicle. Three methods are discussed: the multiple primary coil; the multiple sensing coil; and the variable displacement technique. For the variable displacement method, the sigma u profile (where sigma is the average conductivity mhos/m and u is the average velocity m/sec) is obtained in terms of the Fourier transform of the meter signal and the magnetic field geometry. Experimental results obtained using the multiple sensing coil method show favorable sensitivity as indicated by more than a factor of two change in signal between the outermost coils. (Author)

AD-261 136 Div. 12, 25
(14 Aug 61) OTS price $3.60

Aerospace Corp., Los Angeles, Calif.
MEASUREMENT OF ELECTRICAL CONDUCTIVITY OF IONIZED AIR DURING RE-ENTRY,
by R. Betchov, A. E. Fuhs, and others. 5 May 61, 31p. incl. illus. tables (Rept. no. TDR-594(1215-01)TR-1, pt.1)
(Contract AF 04(647)594)
Unclassified report

DESCRIPTORS: *Atmosphere entry, *Gas ionization, *Conductivity, Re-entry vehicles, Measurement, Plasma physics, *Magnetohydrodynamics, Recovery, Meters, Calibration, Errors, Analysis, Air, Ionization, Electrical properties.

The data from the flight of conductivity meter Number 1 aboard RVX-2A Number 423 were reduced and interpreted. The meter output was found to be correlated with vehicle dynamics during re-entry. The maximum observed value of sigma u B sub z L (where sigma = average conductivity mhos/m, u = average velocity m/sec, B = magnetic flux density webers/square meter, z = component in z-direction which is normal to skin of vehicle, and L = characteristic length m) was 490 amperes/meter. Using estimated average values for u, B sub z, and L, the corresponding average conductivity was 160 mhos/meter. (Author)

AD-261 140 Div. 12, 19
(14 Aug 61) OTS price $1.60

Aerospace Corp., Los Angeles, Calif.
ATTITUDE REFERENCE AS ESTABLISHED BY A HORIZON SCANNER,
by Robert E. Roberson. 19 June 61, 10p. incl. illus. (Rept. no. TDR-594(1560-01)TN-4)
(Contract AF 04(647)594)
Unclassified report

DESCRIPTORS: *Satellite vehicles, *Satellite attitude, Orbital flight paths, Electronic scanners, *Flight attitude indicators, Control systems, Transformations (Mathematics), Earth, Errors, Inertial navigation, Torque, Motion, Mathematical analysis.

An attitude reference frame is defined which is the natural frame defined by a horizon scanner and certain requirements on the forward direction. Relative to this frame there is no systematic sensor error, but its motion introduces inertial reaction torque disturbances into the system. Magnitudes and time structure of the latter are examined for several specific cases. It is concluded that if disturbance torque levels

of the order of 100 dyne-cm are negligible in the system, the horizon scanner reference frame can replace a geocentric vertical frame ad libitum. Otherwise, allowance must be made for the contribution to inertial reaction torque caused by the difference between these frames. (Author)

AD-261 141 Div. 12, 27
(14 Aug 61) OTS price $1.60

Aerospace Corp., Los Angeles, Calif.
AN INTERMITTENT ORBIT SUSTAINING TECHNIQUE,
by Robert E. Roberson. 27 June 61, 12p. incl. illus. (Rept. no. TDR-594(1560-01)TN-5)
(Contract AF 04(647)594)
Unclassified report

DESCRIPTORS: *Satellite vehicles, *Orbital flight paths, Drag, Thrust, *Satellite vehicle trajectories, Celestial mechanics, *Rocket motors, Atmosphere.

An orbit sustaining technique is discussed which allows the perigee to decay to a pre-established lower switching level, then applies a low circumferential thrust greater than the air drag force to drive the perigee to an upper switching level at which thrust is removed. This procedure tends to circularize the orbit, avoids the difficulty of trying to exactly balance drag forces with low thrust, as in some sustaining techniques, and is somewhat more efficient in total impulse than the latter. (Author)

AD-261 194 Div. 12
(14 Aug 61) OTS price $1.75

National Aeronautics and Space Administration, Washington, D. C.
AN AUTOMATIC TERMINAL GUIDANCE SYSTEM FOR RENDEZVOUS WITH A SATELLITE,
by Terrance M. Carney. Aug 61, 68p. incl. illus. tables, 10 refs. (NASA Technical note no. D-923)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-923.

DESCRIPTORS: *Satellite rendezvous vehicles, *Guidance, Automatic, Design, Instrumentation, Rocket motors, Mathematical analysis, *Satellite vehicle trajectories, *Satellite vehicles, *Control systems, Astronautics, *Orbital flight paths.

A steering and control system for automatic terminal guidance in direct-ascent satellite rendezvous, using control of thrust magnitude and direction, is presented and analyzed. For a representative case, rendezvous with a station in a 400-naut-mi circular orbit, the range of initial velocity and displacement errors which the system is able to correct is determined. Generalized considerations for efficient use of such a system are examined. (Author)

AD-261 197 Div. 12, 25
(14 Aug 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
SATELLITE ATTITUDE CONTROL UTILIZING THE EARTH'S MAGNETIC FIELD,
by John S. White, Fred H. Shigemoto, and Kent Bourquin. Aug 61, 38p. incl. illus. (NASA Technical note no. D-1068)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1068.

DESCRIPTORS: *Satellite vehicles, Control, *Stabilization, *Terrestrial magnetism, Magnetic fields, Torque, Magnetic cores, Magnetic guidance.

The torque developed by the interaction of current-carrying coils with the earth's magnetic field can be used as a means of attitude control. The degree to which the attitude of a vehicle can be maintained utilizing this torque depends on the fluctuations of the magnetic field at the satellite as the satellite orbits about the earth. Due to the nature of the torque developed only two vehicle axes can be continuously controlled simultaneously. With the principle described, either a two- or three-coil system can be used to control vehicle attitude about two axes. Intermittent control about three axes can be obtained. (Author)

AD-261 277 Div. 12, 20, 2, 14
(15 Aug 61) OTS price $3.60

Radiation Effects Information Center, Columbus, Ohio.
SPACE RADIATION AND ITS EFFECTS ON MATERIALS,
by Robert F. Redmond. 30 June 61, 34p. incl. illus. tables, 31 refs. (REIC memo. no. 21; Supersedes REIC memo. no. 19, AD-232 160)
(Contract AF 33(616)7375, Proj 1448)
Unclassified report

DESCRIPTORS: *Space environmental conditions, *Astrophysics, *Van Allen radiation belt, *Cosmic rays, Protons, Electrons, Bremsstrahlung, Neutrons, *Shielding, Radiation damage, Radiation effects, Materials, Man, Semiconductors, Solar cells, Space probes, Spaceships, Solar flares.

The status of space radiation research in relation to its effects on materials and man is discussed from the point of view of recent literature. Theories concerning the Van Allen belts, cosmic radiation (galactic and solar cosmic rays), interactions of space radiations with matter (electrons, bremsstrahlung, and protons), and radiation, in particular as it effects man and semiconducting devices, are reported.

AD-261 367 Div. 12
(17 Aug 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
THE COLLISION BOUNDARY BETWEEN THE TWO SEPARATING STAGES OF THE SA-4 SATURN VEHICLE,
by William B. Chubb. Aug 61, 21p. incl. illus. table (Technical note no. D-598)
Unclassified report

Also available from the NASA, Wash. 25, D. C., as NASA technical note D-598.

DESCRIPTORS: Satellite vehicles, *Satellite vehicle trajectories, *Staging, *Booster rockets, Separation, Mathematical analysis, Digital computers, Differential equations.

The methods employed in analyzing collision problems associated with separating stages of multistage vehicles are presented in this report. These methods are applicable for determining

collision boundaries between two separating stages of any vehicle configuration, specific results being a function only of the physical system being considered. The collision area is that area of the lower stage within which no portion of the upper stage can lie prior to separation, if collision is to be avoided after separation. The collision boundary is defined as the line dividing the collision and non-collision areas. Collision boundaries are determined for seven specific cases of separation between the S-I and S-IV stages of the SA-4 version A (escape mission payload) Saturn vehicle. The S-IV stage of the SA-4 version A configuration is assumed to be powered by four 17.5 K engines. (Author)

AD-261 444 Div. 12
(18 Aug 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
SOME DETAILS ON THE SOVIET SPACESHIPS.
7 July 61, 10p. incl. illus. 16 refs. (AID rept. 61-101)

Unclassified report

DESCRIPTORS: USSR, Technological intelligence, *Satellite vehicles, Manned, *Space capsules, Pressurized cabins, Training, Design, Flight instruments, Wings, *Spaceships; *Spaceship cabins, Human engineering.

Data are presented on the design of the pilot's cabin in Gagarin's spaceship, the Vostok. An analysis of the data indicated the following: (1) the structure of the spaceship was similar to that of the previous Soviet spaceship-satellites; (2) all the Soviet ship-satellites were launched and recovered by the same program; and (3) the Soviet astronauts were trained in cabins similar to that of the Vostok. (Author)

AD-261 454 Div. 12
(18 Aug 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
FURTHER DETAILS ON GAGARIN FLIGHT.
27 July 61, 6p. incl. table, 5 refs. (AID rept. 61-113)

Unclassified report

DESCRIPTORS: Technological intelligence, USSR, *Satellite vehicles, *Space flight, Booster rockets, Fuel consumption, Re-entry aerodynamics, Manned, Thrust, Spaceship cabins, Thermal insulation, Re-entry vehicles, Spaceships, Satellite vehicle trajectories, Rocket motors.

Three articles have appeared recently which contain information not found in any of the more than 60 Soviet sources published in connection with Gagarin's flight. The first article was written by Professor G. V. Petrovich and published in the Vestnik of the Academy of Sciences USSR. The second is a TASS interview with Professor V. V. Dobronravov, Doctor of Physical and Mathematical Sciences. The third was written by Inna Yavorskaya, whose title is given as Scientific Secretary of the Interplanetary Travel Commsssion of the Academy of Sciences USSR. This report recounts certain details found in these three articles and discusses their implications. Some of the information presented appears to support certain inferences drawn in previous AID reports. (Author)

AD-261 475 Div. 12
(5 Sep 61) OTS price $1.00

Naval Research Lab., Washington, D. C.
AN ORBIT COMPUTER FOR A SATELLITE POSITION DISPLAY.
Interim rept.,
by H. G. Talmadge, Jr. 31 July 61, 39p. incl. illus. tables (NRL rept. no. 5624)
(Proj. SF 019-01-03)

Unclassified report

DESCRIPTORS: *Display systems, Satellite vehicle trajectories, *Orbital flight paths, Position finding, *Digital computers, *Analog computers, Analog-to-digital converters, Servo amplifiers, Tracking, Functions, Shipborne.

A display suitable for presenting earth satellite information on shipboard is being investigated. This study investigates the computational phase of the problem. A combination of digital and analog techniques, with servo amplifiers to position the shafts of magnetic resolvers which generate sine and cosine functions, is proposed to implement equations derived for the calculation of satellite height and of subsatellite position as latitude and longitude. Orbital elements and initial conditions are selected for up to ten satellites out of the total in a digital store, and positions are computed for each in turn at any arbitrary time. Computer output appears in digital form and, depending upon display design, may be either placed in a register or displayed directly. Essentially continuous orbits can be computed as a succession of subsatellite positions corresponding to small discrete increments in time through an anomalistic period bracketing the selected epoch. According to display design, the resulting subsatellite track will be either displayed directly or stored in a scan-converter cathode-ray tube. (Author)

AD-261 487 Div. 12, 19
(18 Aug 61) OTS price $11.00

Raytheon Co., Sudbury, Mass.
INVESTIGATION OF ACTIVE DOPPLER VELOCITY SENSOR.
Quarterly engineering rept. no. 4, 1 Mar-31 May 61.
31 May 61, rev. June 61, 143p. incl. illus. tables (Rept. no. AED-444, rev.)
(Contract AF 33(616)7388)

Unclassified report

DESCRIPTORS: *Doppler navigation, *Doppler radar, *Radar navigation, Radar equipment, Velocity, *Hypervelocity vehicles, *Lunar probes, Moon, Landing, Spaceships, *Space navigation, Position finding, *Automatic navigators, Terrain, Errors, Radar receivers, Modulation, Mathematical analysis, Tracking Plasma physics, Gas ionization, Power supplies, Electromagnetic effects, Range finding, Signal-to-noise ratio, Frequency modulation.

Long Pulse modulator and power supply design problems were investigated and the effects of power supply regulation on the Long Pulse sideband distribution were considered. Development and testing of a PRF tracker and coherent transponder continued. The theory of spectral compression was modified and airborne equipment reworked for the second series of flight tests. Ranging techniques for the lunar landing requirement were considered and the most promising one selected for laboratory investigation. Optimum filtering studies and the development of a frequency tracker (incorporating the results of optimum filtering studies) continued. The 35 kmc

receiver measurements were completed and promising results were obtained from the laboratory model of the 13.5 kmc parametric amplifier. Effort also continued on the wide dynamic range IF amplifier. The calculations on the effects of the plasma sheath on Doppler navigator operation were completed. (Author)

AD-261 490 Div. 12, 9
(18 Aug 61) OTS price $1.60

Astrophysical Observatory, Smithsonian Institution, Cambridge, Mass.
EFFECT OF THE DIURNAL ATMOSPHERIC BULGE ON SATELLITE ACCELERATIONS.
Rept. on Research in Space Science, by Stanley P. Wyatt. 29 May 61, 17p. incl. table, 11 refs. (Special rept. no. 63)
(Sponsored by National Aeronautics and Space Administration)
Unclassified report

DESCRIPTORS: *Satellite vehicle trajectories, Orbital flight paths, *Acceleration, *Drag, Atmosphere, Exosphere, Density, Diurnal variations, Solar energy, Mathematical analysis, Integration, Astrophysics.

Formulas are developed to express the secular acceleration of a satellite on passing through an atmosphere which bulges in the sunward direction and in which the scale height increases with height, these two properties of the high atmosphere having previously been established from satellite observations. Comparison of the new formulas with those for a spherically symmetric atmosphere of constant scale height indicates that deduced atmospheric densities may be systematically incorrect by up to 50 or 60% at heights of 500 to 600 km when the simpler equations are used. (Author)

AD-261 491 Div. 12, 9
(18 Aug 61) OTS price $1.60

Astrophysical Observatory, Smithsonian Institution, Cambridge, Mass.
THE REVISED ORBIT OF SATELLITE 1958 ZETA.
Rept. on Research in Space Science, by Rajendra C. Nigam. 7 July 61, 12p. incl. tables (Special rept. no. 64)
(Sponsored by National Aeronautics and Space Administration)
Unclassified report

DESCRIPTORS: *Satellite vehicles, *Orbital flight paths, Determination, Mathematical analysis, Integration, Tables, Astrophysics, Satellite vehicle trajectories.

AD-261 492 Div. 12, 9
(18 Aug 61) OTS price $5.60

Astrophysical Observatory, Smithsonian Institution, Cambridge, Mass.
ATMOSPHERIC DRAG ON NON-SPHERICAL ARTIFICIAL SATELLITES.
Rept. on Research in Space Science, by Pedro E. Zadunaisky. 14 July 61, 57p. incl. illus. tables, 21 refs. (Special rept. no. 65)
(Sponsored by National Aeronautics and Space Administration).
Unclassified report

DESCRIPTORS: *Satellite vehicles, Aerodynamic configurations, *Drag, Orbital flight paths, Atmosphere, *Atmosphere models, Tables, Mathematical analysis, Determination, Rotation, Tumbling, Satellite vehicle trajectories.

The rate of decrease of the anomalistic period of an artificial satellite caused by atmospheric drag depends essentially on the atmospheric density, the effective cross-section of the satellite, its orbital elements, and on an aerodynamic coefficient. An attempt is made to build up an internally consistent picture of the variation of all these quantities, during a period of about two and a half months, by using orbital data from Satellites 1958 Delta 1, 1958 Beta 2, 1958 Epsilon, 1958 Alpha and 1958 Beta 2. For a correct inter-comparison of these data, the diurnal effect of solar activity is taken into account by assuming a suitable model of the earth's atmosphere. The first four satellites mentioned are non-spherical; to determine the variation of the effective cross-section due to the tumbling a technique is used which produces a good agreement with experimental evidence drawn from sources not directly related to the drag phenomena. (Author)

13. INSTALLATIONS AND CONSTRUCTION

AD-261 193 Div. 13, 16
(14 Aug 61) OTS price $2.60

Armed Forces-NRC Committee on Bio-Astronautics, Washington, D. C.
WASTE-RECOVERY PROCESSES FOR A CLOSED ECOLOGICAL SYSTEM,
by Wesley O. Pipes. Apr 61, 22p. incl. illus. tables, 27 refs. (Publication no. 898)
Unclassified report

DESCRIPTORS: *Closed cycle ecological systems, *Metabolic products, *Urine, Recovery, Purification, Oxidation.

For any closed ecological system the wastes produced by the human occupants, either directly or indirectly, present a problem since they may contain pathogenic microorganisms and toxic materials, but also they represent the raw material upon which food production in the systems must be based. Processes for the purification and recovery of these waste materials must prevent contamination of the environment with the wastes and must convert the wastes into materials which may either be employed for food production or be consumed directly by the human occupants. Several different processes which might be employed for waste purification and recycling in a closed ecological system have been reviewed. Most of these processes are known to be feasible because they have been employed or studied as waste disposal processes for terrestrial application. However, a great deal of study will be required before minimum size and weight designs for these processes can be developed and before selection of the best process may be made. Other theoretically feasible processes have not been studied sufficiently for detailed consideration. (Author)

AD-261 406 Div. 13, 25
(17 Aug 61) OTS price $7.60

Winslow Labs., Rensselaer Polytechnic Inst., Troy, N. Y.
STRESSES AND DISPLACEMENTS PRODUCED IN AN ELAS-

TIC HALF-SPACE BY AN ELLIPTICAL PUNCH,
by Robert L. Schiffman and Bhagwan D. Aggarwala.
Dec 60, 76p. incl. illus. tables.
(Contract Nonr-59111, Proj. NR 081-244)
Unclassified report

DESCRIPTORS: *Elasticity, *Soils, Stresses, Load distribution, Buildings, Mathematical analysis, Potential theory, Partial differential equations, Solids, Tables.

The problem is treated of the elastic half-space loaded by a rigid elliptical footing on the free surface. The solution develops general formulas for the stresses and displacements within and on the surface of the solid. Computations are presented for the contact pressure and for the stresses along the centroidal axis of the ellipse. These computations are presented for varying ranges of elastic properties and for an eccentricity range of the loading ellipse. In addition to the solution to the particular problem of an elliptical loading, an outline is given for the solution of stresses and displacements due to an arbitrarily shaped area by electric tank analogy techniques. (Author)

AD-261 451 Div. 13, 29, 17, 2
(18 Aug 61) OTS price $1.60

Science and Tech. Section, Air Information Div., Washington, D. C.
SOVIET LITERATURE ON PROTECTIVE STRUCTURES AND COMPONENTS.
Monthly rept. no. 2 for May 61.
7 July 61, 14p. incl. illus. (AID rept. 61-99)
Unclassified report

DESCRIPTORS: *Underground structures, Protective coverings, *Shelters, Rock, Pressure, Geophysics, Cosmic rays, Construction, Recording devices, Automatic weapons, Mining engineering, Communication systems, *USSR.

AD-261 474 Div. 13, 17
(18 Aug 61) OTS price $4.60

Fritz Engineering Lab., Lehigh U., Bethlehem, Pa.
COLUMN DESIGN IN CONTINUOUS STRUCTURES.
Rept. on Welded Continuous Frames and Their Components,
by M. Ojalvo and V. Levi. June 61, 41p. incl. illus. (Rept. no. 278.4)
(Contract Nonr-61003)
Unclassified report

DESCRIPTORS: *Beams, Structures, Design, Mechanics, Civil engineering, Moments, Welded joints, Buildings, Steel, Plasticity, Deformation, Load distribution, Mathematical analysis, Stresses.

A new method for the design of columns in multistory continuous frames is developed. The method applies to planar frames adequately braced against sway. Rotational restraint furnished by members framing into the column in question is considered. The method is illustrated by the design of an interior column. Charts necessary for the application of the method are appended. (Author)

14. MATERIALS (NON-METALLIC)

AD-260 867 Div. 14, 4
(8 Aug 61) OTS price $3.60

Material Lab., New York Naval Shipyard, Brooklyn.
SYNTHESIS OF ORGANOMETALLIC POLYMERS.
Progress rept. no. 5, 1 July 60-13 May 61,
by A. D. Delman and R. J. Katzenstein. 2 Aug 61, 1v. incl. illus. tables, 12 refs. (Lab. proj. 6135)
Unclassified report

DESCRIPTORS: *Heat resistant polymers, Silanes, *Polymers, *Metalorganic compounds, Aluminum compounds, Zirconium compounds, Titanium compounds, Lead compounds, Iron compounds, Carboxylic acids, Chemical bonds, Molecular structure, Infrared spectroscopy, Phenyl radicals, Decomposition, Stability, Synthesis, Gravimetric analysis, Pyrolysis.

Studies are under way for the synthesis of organometallic polymers similar in molecular structure to the silicones, but containing metal atoms or metallic oxides in their polymeric chains. In this connection, results of preparation of several different metallic salts of poly(beta-carboxyethyl (methyl) siloxane) are presented. Results of thermal stability studies of these metal salts of the polymer indicate that the original carboxylated polymer is more heat resistant than are the various metallic salt derivatives. The Al, Zr, and Ti products are more thermally stable than are the Pb, $(C_6H_5)_2$ Pb, and Fe salts of the polymer. Correlation of relative heat resistant properties of the various metal salts of the siloxane polymer with bond dissociation energy values is presented. (Author)

AD-260 920 Div. 14, 26, 31
(8 Aug 61) OTS price $1.60

Rubber Lab., Mare Island Naval Shipyard, Vallejo, Calif.
DEVELOPMENT OF SEALS FOR HIGH PRESSURE AIR SYSTEMS IN SUBMARINES.
Progress rept. no. 5,
by R. D. Ford. 31 July 61, 12p. incl. table.
(Rept. no. 28-7)
(Proj. no. S-F013-13-01)
Unclassified report

DESCRIPTORS: *Seals, *Rubber seals, Synthetic rubber, Submarines, *Pneumatic systems, High pressure research, Effectiveness, Tests, Physical properties, Mechanical properties, Air, Compressed air, Materials.

Studies were conducted to develop a formulation for rubber seals to be used in the high pressure air systems of FBM submarines. The best stock which the Laboratory had developed previously for this service was a Viton A-HV stock identified as Compound A. An objectionable feature of this stock was its tendency to backrind when molding. A new Viton A-HV stock (377-89) was developed which does not backrind and which is also suitable for use in seals for high pressure gas service. Four sets of O-rings submitted by the Parker Seal Company were tested for resistance to swelling caused by rapid release of 5000 psi air pressure. Two of the sets of O-rings were fairly resistant to swelling, but were not equal to Compound A or 377-89 in this regard. O-rings made by Linear Incorporated and conforming to Classes A and B of specification MIL-P-5516B were tested for swelling. Both the Class A (88 shore) and Class B (68 Shore) O-rings were seriously swollen, and the Class B)O-rings exhibited many small blisters after decompression. The Class A

O-rings were considered to be of marginal utility in high pressure air systems. The Class B O-rings were considered to be unsuitable for this purpose. (Author)

AD-260 927 Div. 14, 2, 29
(9 Aug 61) OTS price $4.60

Southwest Research Inst., San Antonio, Tex.
ATMOSPHERIC OZONE IN NORTHERN GREENLAND,
by Herbert C. McKee. Jan 61, 48p. incl. illus.
(Contract DA 23-072-ORD-1375, Proj. TB5-1401)
Unclassified report

DESCRIPTORS: Atmosphere, *Climatic factors, Rubber, Tires, *Deterioration, *Military equipment, Military operations, *Ozone, Density, Greenland, Arctic regions.

This investigation was undertaken to measure atmospheric ozone and related factors in northern Greenland, in an attempt to identify the environmental factors which were responsible for the excessive cracking of tires and other rubber items in storage. Atmospheric ozone concentrations were found to range from zero to 1.3 parts per hundred million (pphm) during the five-day period in July, 1960 when measurements were made. The maximum values occurred during the middle of the day when sunlight intensity was at a maximum; values of zero or very near zero were found during nighttime hours when the sun was nearer the horizon, or during periods of fog or cloudy weather. (This was during the period of 24-hour daylight.) It was concluded that atmospheric ozone occurs in northern Greenland by the same mechanism responsible for ozone formation in other locations. There was no evidence to indicate that ozone was brought to the sampling location by any unique transport mechanism, even though some of the meteorological and topographic factors indicated that such phenomena might occur. Deterioration of rubber was evidently due to atmospheric ozone, although low temperatures or other environmental factors may have also contributed to the observed effects. (Author)

AD-260 982 Div. 14, 26
(10 Aug 61) OTS price $2.00

Emerson and Cuming, Inc., Canton, Mass.
SILICA MICROBUBBLES.
Rept. for July 58-Nov 59, on Nonmetallic and Composite Materials,
by J. W. Lefforge. Dec 60, 63p. incl. illus. tables.
(Contract AF 33(616)5840, Proj. 7340)
(WADD TR 60-899, pt. 1) Unclassified report

DESCRIPTORS: *Silicon compounds, Dioxides, Sodium compounds, Boron compounds, *Silicates, *Glass, Bubbles, Spheres, Thermal insulation, Insulating materials, Physical properties, Preparation, Production, Electrical properties, Dielectric properties.

Glass microbubbles 0.150 to 0.020 mm diameter, having a bulk density of 0.25 g/cc and a true density of 0.50 g/cc have been greatly improved by decreasing the alkali content and also by making them of vitreous silica. The improvements consist of marked decrease in moisture adsorption, enhanced electrical properties, and great increase in maximum use temperature. An acid leaching technique applied to the commercially available 18% alkali (Eccospheres) of Emerson & Cuming, Inc. reduces the alkali content to 6% and increases the maximum use temperature from 500 to 800 C. Formation from pure silica by a direct high temperature process to give a vitreous silica bubble retains the useful characteristics of the low-melting-alkali-glass bubble with the desirable properties of vitreous silica - low to negligible moisture adsorption, outstanding dielectric properties even at high temperature, and a safe use temperature for most applications of 1300 C. The feasibility of the direct process has been briefly demonstrated on pilot plant scale at 2 lb/hr rate. Work on bonding the high temperature product into structural shapes is described. (Author)

AD-260 988 Div. 14, 7, 26
(10 Aug 61) OTS price $.50

General Electric Co., Schenectady, N. Y.
INVESTIGATION OF THE STOICHIOMETRIC AND STRUCTURAL VARIABLES WHICH AFFECT CONDUCTIVITY IN FERROMAGNETIC CERAMIC MATERIALS FOR USE IN MAGNETIC CIRCUITS.
Rept. for May 59-May 60, on Magnetic Materials,
by F. H. Horn. Jan 61, 14p. incl. illus.
(Contract AF 33(616)6499, Proj. 7080)
(WADD TR 60-421) Unclassified report

DESCRIPTORS: *Ferromagnetic materials, Ceramic materials, Single crystals, Ferrites, Growth, Iron compounds, Oxides, Magnetite, Electrical properties, Physical properties, Magnetic materials, Electrical conductance, Thermal conductivity, Crystals.

The report deals with the development of the Czochralski method to growing single crystal iron ferrites of the high purity and crystalline soundness necessary to make progress in studies directed toward understanding the electrical properties of ferrites. Only reflectivity peaks have been observed from studies of the optical reflectivity and transmission of magnetite. Resistivity and thermoelectric power as a function of temperature are reported for magnetite. Hall effect studies are inconclusive. Discrepancies between previous data and those obtained are noted. The thermal conductivity of magnetite has been measured as a function of temperature. The room temperature value is about 70 milliwatts, and an abrupt change is noted at the 120 K transition. (Author)

AD-260 989 Div. 14, 13, 3
(14 Aug 61) OTS price $3.60

Institute of Paper Chemistry, Appleton, Wis.
DEVELOPMENT OF AN IMPROVED DIFFUSION BOARD MATERIAL.
Monthly progress rept. no. 9, 29 May-28 June 61,
by L. E. Leporte and T. A. Howells. 28 July 61, 32p. incl. illus. tables.
(Contracts DA 18-108-405-cml-941 and DA 18-108-cml-6561, Proj. 2256)
Unclassified report

DESCRIPTORS: *Fiberboard, Shelters, Chemical warfare agents, Aerosols, Diffusion, Penetration, Poisonous gases, Cyanogen chloride, Wood pulp, Additives, Charcoal, Production, Preparation, Physical properties, Countermeasures.

Gas life evaluations of board containing additions of Aquapel 486 and Cato 8 were found to be somewhat lower than previous work with Aquapel 486 would indicate. Drying studies were carried out on newly formed boards by attaching thermocouples to the wet boards in a circulating oven

under various drying conditions. Water absorption, gas life, ash, and inclined panel flame tests were run on samples of board and pulp obtained from the series of pilot runs at the Bauer Bros. Co. Water absorption was slightly less on sized board produced on the pilot machine than comparable board produced in the laboratory and the gas life was slightly better. Tensile strength of the board was around 400 psi for all board except the unsized board and the board containing Cyron; the addition of sizing materials improved the wet strength from less than 20 psi. tensile for unsized board soaked for 2 hr to 214 psi. for board treated with 0.5% Aquapel 360 and 0.2% Kymene 557. The board treated with the Aquapel-Kymene system seemed to have the best properties, 2-hr water absorption was 6% and cyanogen chloride gas life was 42 minutes. (Author)

AD-261 043 Div. 14, 27
(9 Aug 61) OTS price $1.60

Naval Ordnance Lab., White Oak, Md.
HIGH TEMPERATURE RESISTANT MATERIALS FOR MISSILE PROPULSION SYSTEMS.
Quarterly progress rept. 30 Apr-30 June 61.
30 June 61 15p. incl. illus. tables.
Unclassified report

DESCRIPTORS: *Refractory materials, Refractory contings, Insulating materials, *Thermal insulation, *Rocket motor nozzles, Rocket motors, Ceramic materials, Graphite, Asbestos fiber, Laminates, Phenolic resins, Epoxy resins, Ablation, Erosion, Plastics, Glass textiles, Materials, Carbides, Tantalum compounds, Silanes.

Results are presented of tests in the hydrogen-oxygen rocket test motor on TaC nozzle inserts and high temperature materials studies with the oxy-acetylene burner. The TaC nozzle inserts experienced varying degrees of chemical erosion and were inferior to a Mo control specimen. The use of a chemical finish on asbestos mat phenolic laminates showed no improvement. Refrasil cloth, asbestos mat, and epoxy-novolaks laminates showed no special promise and experienced severe delamination. An asbestos mat epoxy novalaks laminate cure with chlorendic anhydride showed good results. A new silicone elastomeric polymer produced a relatively low erosion rate. The use of asbestos mats to improve the erosion resistance of thermoplastic and elastomeric type polymers was demonstrated. An epoxy resin formulation modified to produce a tough char gave poor results while pitch-bonded graphite cloth specimens showed high erosion resistance. A series of porous polyurethane foamed specimens showed improved performance with increasing density.

AD-261 094 Div. 14, 25
(11 Aug 61) OTS price $4.60

International Business Machines Corp., San Jose, Calif.
ISOTHERMAL SQUEEZE FILMS,
by W. E. Langlois. 22 May 61, 44p. incl. illus.
(Rept. no. RJ-192)
(Contract Nonr-344800)
Unclassified report

DESCRIPTORS: *Gas bearings, *Lubricants, Gases, Air, *Films, Pressure, Hydrodynamics, *Thin films, Gas diffusion, Theory, Mathematical analysis, Bearings, Lubrication, Differential equations.

A derivation is presented of the equation governing the pressure in a thin, flat film of ideal gas under isothermal conditions, when the surfaces bounding the film are in relative normal and tangential motion. When tangential motion is absent, the pressure equation reduces to a nonlinear heat equation, which admits of very few closed-form solutions. Various approximation methods are discussed, and two problems involving small periodic variation of the gap between parallel plates are solved by perturbation method for a film in which fluid inertia is negligible. (Author)

AD-261 098 Div. 14, 1, 4
(11 Aug 61) OTS price $2.60

Midwest Research Inst., Kansas City, Mo.
HIGH TEMPERATURE RESISTANT TRANSPARENT PLASTICS.
Quarterly progress rept. no. 1, 15 Feb-14 May 61,
by Howard Christie and Thomas Medved. 15 June 61, 20p. incl. illus. table.
(Contract NOw 61-0673-d; Continuation of Contract NOa(s) 60-6099-c)
Unclassified report

DESCRIPTORS: *Epoxy resins, *Heat resistant polymers, Transparent panels, Resins, Plastics, Light transmission, *Epoxides, *Optical plastics, Films, Plastic coatings, *Optical coatings, Phenols, Vinyl radicals, Cyclohexenes, Anhydrides, Phthalic acids, Polycyclic compounds, Heptanes, Octanes, Synthesis, Preparation, Bleaching agents, Boron compounds, Supersonic planes.

Purification of the diglycidyl ether of bisphenol A by vacuum distillation and decolorization of the trimethoxyboroxine catalyst produced colorless starting materials. After curing in vacuum at 375 F for 4 hr, the 0.25 in. thick castings had a luminous transmission of 88%. In addition to an improvement of the color of the cured castings, an increase in thermal resistance was obtained. Determination of the physical properties of the vinylcyclohexene dioxide-hexahydrophthalic anhydride resins was initiated. Small quantities of low color epoxy novolac resin were obtained by molecular distillation of a commercial product. Pound quantities of the bisbicyclic diepoxides were synthesized for investigation of curing reactions and measurement of thermal properties. (Author)

AD-261 147 Div. 14
(14 Aug 61) OTS price $8.10

Battelle Memorial Inst., Columbus, Ohio.
DATA FOR THERMOPLASTIC COMPOUNDS.
Final rept. on Services, Investigations, and Tests on Standard and Nonstandard Parts and Materials,
by A. P. Metzger, B. L. Kolsto and others.
30 Apr 61, 82p. incl. illus. tables, 23 refs.
(Contract DA 36-039-sc-85294)
Unclassified report

DESCRIPTORS: *Plastics, *Polymers, *Heat resistant polymers, Propenes, Carbonates, Acetals, Specifications, Mechanical properties, Physical properties, Preparation, Manufacturing methods, Molding, Molding materials, Electrical properties, Tensile properties, Shock resistance, Temperature, Climatic factors, Tests, Test methods, Standardization, *Resins.

Division 14-MATERIALS (NON-METALLIC)

The investigation conducted for the purpose of defining a procurement specification for commercial polypropylene, polycarbonate and polyacetals is summarized. The specification requires that only polymer grades be differentiated and the major parameters be established. Materials and test methods were selected by agreement between the Signal Materiel Support Agency and Battelle. Whenever possible, standard test methods were used. Physical-property limits were established and specification recommendations made for the three polymers.

AD-261 161 Div. 14, 27, 12
(24 Aug 61) OTS price $1.10

Bendix Products Div., Bendix Corp., South Bend, Ind.
SERVICES TO GENERATE BASIC ENGINEERING DATA ON THE BEHAVIOR OF PLASTIC COMPOSITE STRUCTURES UNDER VARIOUS CONDITIONS OF STRESS.
Monthly progress rept. no. 5, 1-31 July 61,
by F. P. Weldy. 5 Aug 61, 6p. incl. illus.
(Contract NOw 61-0488-c)
Unclassified report

DESCRIPTORS: *Plastics, *Pressure vessels, *Rocket cases, Filament wound construction, Glass textiles, Resins, Reinforcing materials, Structures, Stresses, Tests, Hydrostatic pressure, Laminates.

Results are presented of D-ring tests from prepreg tapes of yarn to study the effect of loading rate on glass strength. Loading rates were varied from 3000 to 150,000 lb/minute. Four 7-in.-diam pressure vessels were fabricated and tested. The wrap pattern and mandrels were the same as used in previous bottles. Three of the bottles were varied from the so-called balanced case, 2 layers of circumferential to each layer of longitudinal wrap. These 3 cases failed in the circumferential windings. The case with 4 longitudinal and 7 circumferential layers failed in the end dome. Strength to weight ratios were obtained in the cylindrical section of 1.02 to 1.345 x 10 to the 6th power.

AD-261 231 Div. 14, 4
(15 Aug 61) OTS price $3.60

Rutgers U. School of Chemistry, New Brunswick, N. J.
STABLE BORON POLYMER:
Final rept. (Doctoral thesis),
by Charles E. Erickson and Edward G. Meloni.
31 July 61, 31p. incl. illus. tables.
(Contract Nonr-40414)
Unclassified report

DESCRIPTORS: *Heat resistant polymers, *Boron compounds, Amines, Nitrogen compounds, Hydroxides, Polymers, *Polymerization, Chemical bonds, Molecular structure, Stereochemistry, Chemical reactions, Synthesis, Thermochemistry, Stability, Infrared spectroscopy.

The preparation and chemical properties of B monomers with the desired attributes for incorporation in high temperature polymers are discussed. The primary objective of the study was a polymer containing the B-O-B linkage and having tetravalent B atoms which would be resistant to O and moisture. The compound 4-dimethylaminobutyldihydroxyborane was obtained as an open chain trimer and was shown to have an inner B-N bond; difficulty of closing the ring and failure to prepare higher polymers from it appears to be due to steric effects. It was concluded that internal B-N bonds increase the kinetic stability of B compounds; the desired high molecular wt. polymers cannot be obtained; stabilities are limited by a tendency to lose amino groups by volatilization.

AD-261 278 Div. 14, 20, 1
(15 Aug 61) OTS price $8.60

Radiation Effects Information Center, Columbus, Ohio.
THE EFFECT OF NUCLEAR RADIATION ON LUBRICANTS AND HYDRAULIC FLUIDS,
by S. L. Cosgrove and R. L. Dueltgen. 31 May 61, 100p. incl. illus. tables, 10 refs. (REIC rept. no. 19)
(Contract AF 33(616)7375, Proj. 1448)
Unclassified report

DESCRIPTORS: *Lubricants, *Hydraulic fluids, *Hydraulic gear fluids, Greases, Mineral oils, Oils, Petroleum, Gas turbines, Lubrication, *Airplane engine oils, *Radiation damage, Gamma rays, Esters, Ethers, Silanes, Silicon compounds, Silicates, Fluorocarbons, Benzenes, Phenyl radicals, *Antiseize compounds, Lubricant additives, High temperature research, Stability, Films, Alkyl radicals, Low temperature research.

Radiation-resistant gas-turbine-lubricant studies have led to the development of polyphenyl ethers, alkylated aromatics, and alkylated aromatic ethers. Calresearch 59R-439 hydraulic fluid, an inhibited isopropyl-1,9-diphenylnonane, is the most promising radiation-resistant formulation. The extremely stable polyphenyl ethers should find application where higher pour points (about 5 F) can be tolerated. The combination of radiation-stable fluids (alkylated aromatics) and modified soap or nonsoap thickeners has resulted in greases of adequate radiation stability for anticipated ANP needs. Commercial dry-film lubricants appear to be unaffected by gamma exposures to 2 x 10 to the 11th power ergs/g (C). Alkali-metal silicates appear to be satisfactory binders for high-temperature applications, and exposures to 4.4 x 10 to the 11th power ergs/g (C) or higher. (Author)

AD-261 346 Div. 14, 4
(17 Aug 61) OTS price $.50

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
KINETICS OF THE THERMAL DEGRADATION OF POLYSTYRENE AND POLYETHYLENE,
by David A. Anderson and Eli S. Freeman. July 61, 17p. incl. illus. (Technical rept. no. FRL TR 32)
(Proj. 504-01-027)
Unclassified report

DESCRIPTORS: *Ethylenes, *Styrenes, Polymers, *Decomposition, *Pyrolysis, Gravimetric analysis, Vacuum apparatus, *Heat resistant polymers, Reaction kinetics, Thermochemistry, Test equipment, Test methods.

The non-isothermal method of Freeman and Carroll is used to investigate the kinetics of the thermal degradation of polyethylene and polystyrene. The reactions were studied thermogravimetrically under a vacuum of 1 mm Hg. Decomposition appears to occur in stages. The rate parameters were determined for each region of reaction. Mechanisms of

degradation are suggested. The results of this investigation are compared with the kinetic parameters reported by other investigators for the decomposition of these polymers. (Author)

AD-261 348 Div. 14
(17 Aug 61) OTS price $2.60

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
EFFECT OF RATE OF LOADING ON TENSILE PROPERTIES OF GLASS-REINFORCED POLYESTERS,
by Mitchel Chmura and Elise McAbee. Aug 61, 30p. incl. illus. tables (Technical rept. no. FRL TR 39)
(Proj. 593-32-002)
Unclassified report

DESCRIPTORS: *Laminates, *Glass textiles, *Plastics, Stresses, Shear stresses, Tensile properties, Mechanical properties, Fibers, Reinforcing materials, Structures, Thickness, Polymers, Esters, Resins, Test methods, Load distribution.

The effects of increasing the rate of loading on the tensile properties of glass-reinforced plastics of various types were studied and compared. The rates investigated were the conventional, or static, which produces failure in approximately 2 minutes, and the high rate, which produces failure in approximately 6 milliseconds. The materials studied were polyester laminates containing different types of glass reinforcing material. The effects of the direction of the reinforcing material on the tensile properties were investigated. Changes in the interlaminar shear properties due to changes in the loading rate are discussed. (Author)

AD-261 366 Div. 14, 12
(17 Aug 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
THE STIFFNESS PROPERTIES OF STRESSED FABRICS AS OBTAINED FROM MODEL TESTS,
by George W. Zender and Jerry W. Deaton. Aug 61, 17p. incl. illus. tables (Technical note no. D-755)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-755.

DESCRIPTORS: *Textiles, Structures, Spaceships, Films, *Nylon, *Synthetic rubber, *Synthetic fibers, Rubber coatings, Sheets, Cylindrical bodies, Beams, Stresses, Deformation, Tensile properties, Torque, Load distribution, Shear stresses, Pressure, Model tests, Design, Pneumatic devices.

The stiffness properties of a nylon-neoprene fabric material subjected to uniaxial, biaxial, or shear stresses as obtained from tests of simple models are presented. The stiffness properties are applicable to problems involving applied loads after the fabric is in an initial state of biaxial tension such as occurs upon inflation. The results demonstrate the inadequacy of uniaxial tests in obtaining the stiffness properties to be used in the design and analysis of inflatable fabric structures. To obtain proper stiffness values for use in the design and analysis of stressed fabric structures, tests of simple models of the type presented, subjected to stress conditions similar to those anticipated in the full-scale design, are recommended. (Author)

AD-261 373 Div. 14, 4, 27
(16 Aug 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
STABILITY OF TITANIUM NITRIDE AND TITANIUM CARBIDE WHEN EXPOSED TO HYDROGEN ATOMS FROM 298 TO 1950 K,
by Warren H. Philipp. Aug 61, 15p. incl. illus. tables (NASA Technical note no. D-1053)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1053.

DESCRIPTORS: *Titanium compounds, Nitrides, Carbides, Stability, *Decomposition, Hydrogen, Atoms, Refractory materials, High temperature research, Low pressure research, Thermodynamics, Rocket propulsion, Exhaust gases, Exhaust nozzles.

No appreciable reaction was observed from 298 to 1950 K when TiN or TiC was exposed to H atoms at 1/10,000 atm pressure. At the lower temperatures, thermodynamic calculations show that such reactions should be favored; however, the reaction rates should be low because of the kinetics, since the reaction product Ti, which is a good catalyst for H atom recombination, would not readily be volatilized. Also determined were the rates of decomposition of TiN and TiC in vacuum and in molecular H2 at 1/1000 atm pressure. Thermodynamic computations support the experimental data on the evaporation rates in vacuum and the fact that TiN and TiC are not expected to react appreciably with molecular H2 from 298 to 2000 K. (Author)

AD-261 380 Div. 14, 17
(16 Aug 61) OTS price $1.60

Narmco Industries, Inc., San Diego, Calif.
POTENTIAL OF FILAMENT WOUND COMPOSITES.
Monthly progress rept. no. 5, 1-31 July 61, by C. Y. Chia, B. Duft, and S. Dharmarajan. July 61, 11p. incl. illus. 7 refs.
(Contract NOw-61-0623-c)
Unclassified report

DESCRIPTORS: *Filament wound construction, Glass textiles, Resins, Tensile properties, Matrix algebra, Stresses, Special functions, Stability, Fibers, Reinforcing materials, Failure (Mechanics), Plastics, Equations of state, Shear stresses, Titanium, Epoxy resins, Laminates, Mathematical analysis, Equations, Theory.

An imperfect fiber-resin composite bar is analyzed for tensile load. The resin or matrix stress-strain behavior is assumed nonlinear, to be represented by a hyperbolic sine function. Equations are derived for condition of stability on the dimensions of the composite bar and to find the maximum load for given composite dimensions. (Author)

AD-261 405 Div. 14, 25
(25 Aug 61) OTS price $1.60

Army Signal Research and Development Lab., Fort Monmouth, N. J.
PROPERTIES OF HOT-PRESSED BARIUM TITANATE,
by Arthur Brown and Robert Fischer. Apr 61, 15p. incl. illus. (ASRDL Technical rept. no. 2196)
Unclassified report

DESCRIPTORS: Barium compounds, *Titanates, *Ferroelectric materials, Ceramic materials, Electrical properties, Physical properties, Processing, Production, Microstructure, Dies, Hydraulic presses, Induction heating, Sintering, Dielectric properties, Aging, Density.

A technique for hot-pressing dense, nonreduced, fine-grained barium titanate is described, and the electrical properties of this body are compared with the properties of kiln-fired barium titanate. (Author)

AD-261 461 Div. 14
(18 Aug 61) OTS price $1.60

Carborundum Co., Niagara Falls, N. Y.
DEVELOPMENT OF ULTRA REFRACTORY MATERIALS.
Progress rept. no. 25, 1 May-31 July 61,
by Peter T. B. Shaffer. 16 Aug 61, 17p. incl. illus.
(Contract NOrd-17175)
Unclassified report

DESCRIPTORS: *Refractory materials, *Carbides, Zirconium compounds, Tantalum compounds, Phase studies, Melting, Temperature, Measurement, Radomes, Materials, Phase transitions, Thermal stresses.

The study of solid solutions of TaC and ZrC was continued. The melting temperatures and calculated spectral emissivities showed a reversible change to occur on heating the pure carbides. This change is accompanied by a marked decrease in emissivity and resistivity. The measured melting temperatures are lower than the reported values. The cause of the low melting temperatures, due possibly to non-stoichiometry or failure to correct completely for emissivity, has not been resolved. A survey was started to determine whether radome materials with improved thermal shock resistance can be developed. A few zero expansion and low expansion ceramic bodies were prepared for testing. (Author)

AD-261 467 Div. 14, 8
(18 Aug 61) OTS price $3.60

General Electric Co., Schenectady, N. Y.
INVESTIGATION FOR THE DEVELOPMENT OF CERAMIC BODIES FOR ELECTRON TUBES,
by H. R. Wisely. 14 July 61, 30p. incl. tables, 44 refs. (Scientific rept. no. 3)
(Contract AF 19(604)7410)
(AFCRL-563) Unclassified report

DESCRIPTORS: *Electron tubes, *Ceramic materials, *Thermal expansion, Silicon compounds, Dioxides, Aluminum compounds, Oxides, Alkaline earth compounds, Silicates, Crystal structure, Phase transitions, Crystallization, Thermal stresses, Shock resistance, Preparation, Heat treatment, X-ray diffraction analysis, Materials, Seals, Vacuum seals.

Experimental compositions are being prepared to investigate the properties (particularly thermal expansion) of ceramic bodies composed of the following: (1) microcrystalline quartz synthesized from amorphous silica, (2) stabilized gamma Al_2O_3; (3) stabilized enstatite($MgO.SiO_2$); (4) synthetic alkaline-earth silicates, such as diopside ($CaO.MgO.2SiO_2$) and merwinite ($3CaO.MgO.2SiO_2$); (5) magnesia, containing NiO or Li_2TiO_3 in solid solution; (6) forsterite compositions forming possible solid solutions; and (7) members of the akermanite-gehlenite solid-solution series. Initial results from exploratory experiments indicate that quartz is readily formed from silica gel doped with 1 mol-% CaO, if heated between 1000 and 1100 C. Other doping agents that were tested promoted cristobalite formation. The first attempt to stabilize enstatite by the addition of 1 mol-% diopside failed. The compositions designed to produce synthetic diopside or merwinite show considerable promise as ceramic bodies. (Author)

15. MATHEMATICS

AD-260 822 Div. 15, 8
(8 Aug 61) OTS price $3.60

Diamond Ordnance Fuze Labs., Washington, D. C.
TRANSLATIONAL ADDITION THEOREMS FOR SPHERICAL VECTOR WAVE FUNCTIONS,
by Orval R. Cruzan. 10 Mar 61, 33p. incl. illus.
(DOFL rept. no. TR-906)
(Proj. 24724)
Unclassified report

DESCRIPTORS: *Electromagnetic waves, Mathematical analysis, *Special functions, *Wave analysis, Harmonic analysis, Transformations (Mathematics), Vector analysis, Electromagnetic wave reflections, Diffraction, *Spheres.

Translational addition theorems for spherical vector wave functions are derived in a reduced form. The reduction is accomplished by the use of formulas relating the coefficients that arise in expansion of the product of two associated Legendre functions. These addition theorems should be useful in those cases in which spherical vector wave functions are used where the distances of bodies and sources are separated by the order of a few wavelengths. (Author)

AD-260 924 Div. 15, 32
(9 Aug 61) OTS price $3.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
ON THE ECONOMIC WELFARE FUNCTION,
by Ken-ichi Inada. 13 July 61, 30p. (Technical rept. no. 97)
(Contract Nonr-22550, Proj. NR-047-004)
Unclassified report

DESCRIPTORS: Functional analysis, *Functions, Sociometrics, Economics, Partial differential equations, Convex sets, *Scheduling, *Games theory, Matrix algebra, Matrix calculus.

AD-260 925 Div. 15, 26
(8 Aug 61) OTS price $5.60

Applied Mathematics and Statics Labs., Stanford U., Calif.
DYNAMIC PROGRAMMING AND STATIONARY ANALYSES OF

INVENTORY PROBLEMS,
by Donald L. Iglehart. 7 July 61, 50p. 11 refs.
(Technical rept. no. 27)
(Contract Nonr-22528, Proj. NR-047-019)
Unclassified report

DESCRIPTORS: *Scheduling, *Linear programming, Probability, Distribution theory, Functions, Sequences, Integral equations.

The principal concern is to show a relationship between the dynamic programming solutions and the stationary solutions of a dynamic inventory problem. (Author)

AD-260 956 Div. 15
(11 Aug 61) OTS price $1.60

Institute of Mathematical Sciences, New York U., N. Y.
ON FAMILIES OF SETS REPRESENTED IN THEORIES,
by Hilary Putnam. June 61, 9p. (Rept. no. IMM-NYU-284)
(Contract AF 49(638)777)
(AFOSR-816) Unclassified report

DESCRIPTORS: *Metamathematics, Algebra, Numbers.

A necessary and sufficient condition is given for a family of sets to be the family of all sets representable in a theory. (Author)

AD-261 013 Div. 15
(10 Aug 61) OTS price $2.60

Naval Ordnance Lab., White Oak, Md.
ON A MEAN VALUE THEOREM OF THE DIFFERENTIAL CALCULUS OF VECTOR-VALUED FUNCTIONS, AND UNIQUENESS THEOREMS FOR ORDINARY DIFFERENTIAL EQUATIONS IN A LINEAR NORMED SPACE,
by A. K. Aziz and J. B. Diaz. 16 May 61, 23p. 20 refs. (Rept. no. NOLTR 61-22; Mathematics Dept. rept. no. M-17)
Unclassified report

DESCRIPTORS: *Vector analysis, *Differential equations, Calculus of variations, Functions, Real variables, Sequences, *Functional analysis.

Suppose that: (1) the vector valued function $x(t)$ is defined for all real t such that $a \leq t \leq b$, where $a < b$, and that its values are in a linear normed vector space B (the norm in B will be denoted by $||\ \ ||_B$; (2) $\lim_{t \to a} x(t) = x(a)$ and $\lim_{t \to b} x(t) = x(b)$ (i.e., for example $\lim_{t \to a} ||x(t) - x(a)||_B = 0$); (3) the derivative $x'(t)$ exists, and is finite, whenever $a < t < b$ (i.e., there is a vector $x'(t)$ in the space B such that $\lim_{s \to t} ||(x(s) - x(t))/(s-t) - x'(t)||_B = 0$). Then there is a number τ, with $a < \tau < b$, such that $||(x(b)-x(a))/(b-a)||_B = ||x'(\tau)||_B$. This mean value theorem for vector valued functions is proved first, and then it is used to derive uniqueness theorems for the (vector) initial value problem $\frac{dx}{dt} = f(t,x)$; $s(t_0) = x_0$. (Author)

AD-261 030 Div. 15, 25
(10 Aug 61) OTS price $1.60

Syracuse U., N. Y.
GAUGE-INVARIANT VARIABLES IN GENERAL RELATIVITY,
by Peter G. Bergmann. 1961, 16p.
(Sponsored by the Office of Scientific Research)
(AFOSR-972) Unclassified report

DESCRIPTORS: *Relativity theory, Transformations (Mathematics), *Groups (Mathematics), *Functional analysis, Topology.

Einstein's field equations for the gravitational field possess solutions having a large variety of topological properties; among them there are solutions whose curvature goes asymptotically to zero at spatial infinity. If we restrict ourselves to solutions that are asymptotically Minkowskian, then it is tempting to try to divide the effects of curvilinear coordinate transformations into those that correspond to a Lorentz transformation and those that represent gauge-type effects. The group-theoretical aspects of such schemes are analyzed. Making a definite assumption concerning the group of curvilinear transformations that will preserve the asymptotic Minkowski character of the metric field, it is concluded that the reduction to a Lorentz-covariant theory is in fact impossible. The course of the analysis suggests, however, that this negative result depends on the initial group of transformations adopted; it is conceivable that a slightly different invariance group would be compatible with a special-relativistic formulation of the theory. (Author)

AD-261 039 Div. 15
(10 Aug 61) OTS price $1.10

Yale U., New Haven, Conn.
SOME PROBLEMS OF LIE GROUPS.
Final technical rept. 1 July 60-30 June 61,
by Louis Auslander. 30 June 61, 4p.
(Contract DA 19-020-ORD-5254, Proj. TB2-0001 (2689))
(AROD rept. no. 2689:2) Unclassified report

DESCRIPTORS: *Groups (Mathematics), Algebra, Algebras.

Structure theorems for discrete subgroups of Lie groups with geometric applications are given, and flows on solvmanifolds are considered. (Author)

AD-261 074 Div. 15
(11 Aug 61) OTS price $1.60

Chicago U., Ill.
ON A CLASS OF DOUBLY TRANSITIVE PERMUTATION GROUPS.
Technical note,
by Noboru Ito. June 61, 16p.
(Contract AF 49(638)858, Proj. 9752)
(AFOSR-936) Unclassified report

DESCRIPTORS: *Combinatorial analysis, *Groups (Mathematics), Algebra.

AD-261 075 Div. 15
(11 Aug 61) OTS price $2.60

Chicago U., Ill.
ON TRANSITIVE SIMPLE GROUPS OF DEGREE 2p, IN

WHICH THE NORMALIZER OF A SYLOW p-SUBGROUP HAS ORDER% 2p.
Technical note,
by Noboru Ito. June 61, 21p. 12 refs.
(Contract AF 49(638)858, Proj. 9752)
(AFOSR-911) Unclassified report

DESCRIPTORS: *Combinatorial analysis, *Groups (Mathematics), Algebra.

Two theorems are proven concerning G, a transitive permutation group, on omega, a set of symbols 1,..., 2p, where p is an odd prime number. In G, which is a simple group, the normalizer of a Sylow p-subgroup has order 2p. Theorem I: If G is doubly transitive on omega, then G is isomorphic to the linear fractional group LF(2,q) with q + 1 equal to 2p. Theorem II: If G is not doubly transitive on omega, then p equals 5 and G is isomorphic to the icosahedral group.

AD-261 076 Div. 15
(11 Aug 61) OTS price $1.60

Chicago U., Ill.
AN ALGEBRA OF ADDITIVE RELATIONS,
by Saunders Mac Lane. May 61, 15p.
(Contract AF 18(600)1383, Proj. 97690; In cooperation with The Rockefeller Institute)
(AFOSR-905) Unclassified report

DESCRIPTORS: *Algebraic topology, *Algebra, Sequences, *Algebras, Groups (Mathematics).

Additive relations are regarded as being basic, and suitable formal axioms valid in the category of all additive relations are set up. The construction of submodules in an abelian category is quite indirect, in that the submodules must be described as equivalence classes of monomorphisms. In the category of additive relations the lattice order properties are present from the start, along with the composition properties. (Author)

AD-261 111 Div. 15
(11 Aug 61) OTS price $1.60

Princeton U., N. J.
ON THE HOMOTOPY GROUPS OF THE CLASSICAL GROUPS,
by Bruno Harris. 1961. 12p.
(Contract AF 49(638)919)
(AFOSR-688) Unclassified report

DESCRIPTORS: *Algebraic topology, *Groups (Mathematics), Algebra, Algebras, Sequences, Matrix algebra.

AD-261 226 Div. 15
(14 Aug 61) OTS price $1.60

Washington U., Seattle.
MATRIX REDUCTION AND APPROXIMATION TO PRINCIPAL AXES,
by Paul Horst. July 61, 15p. incl. table, 12 refs.
(Contract Nonr-47708)
Unclassified report

DESCRIPTORS: *Factor analysis, *Matrix algebra, Theory, Vector analysis.

AD-261 318 Div. 15
(15 Aug 61) OTS price $1.60

Princeton U., N. J.
DUALITY IN NOETHERIAN RINGS,
by James P. Jans. 1961, 14p.
(Contract AF 49(638)919)
(AFOSR-392) Unclassified report

DESCRIPTORS: Groups (Mathematics), *Algebra, Sequences.

AD-261 353 Div. 15, 30
(17 Aug 61) OTS price $2.60

Aerospace Communications and Controls Div., Radio Corp. of America, Burlington, Mass.
A GENERATOR OF PSEUDO-RANDOM BINARY NUMBERS,
Scientific rept. no. 1,
by D. M. Jones. Apr 61, 26p. incl. tables (Rept. no. CR-588-73-S1)
(Contract AF 19(604)8079)
(AFCRL-548) Unclassified report

DESCRIPTORS: *Numbers, *Probability, *Digital computers, *Statistical distributions, Programming.

The purpose of this study was to design and test a digital computer program capable of generating sequences of pseudo-random binary digits in which the probability of a 1 occurring possesses some pre-assigned value, po say (and hence the probability of a 0 occurring is 1 - po). The parameter po can take values in the range (0, 1/2). It is called the Transition Probability, by analogy to the binary symmetric communication channel, and pseudo-random binary sequences of the type described can in fact be used to simulate noise in such a channel. This report describes two programs (written for STREAC, a digital computer). The first program generates and prints out sequences of pseudo-random binary digits, the second program accumulates and prints out certain statistics relating to these sequences. The statistics can be used to test for apparent randomness. Conditions were found under which the generator gives satisfactory results on the basis of the empirical tests made. Details of the testing procedure and the numerical results obtained are described. (Author)

AD-261 356 Div. 15
(16 Aug 61) OTS price $1.60

Institute for Advanced Study, Princeton, N. J.
ON STABILITY OF COMPACT SUBMANIFOLDS OF COMPLEX MANIFOLDS,
by K. Kodaira, July 61, 19p.
(Contract AF 49(638)253)
(AFOSR-1147) Unclassified report

DESCRIPTORS: Functions, *Complex variables, *Algebraic topology, *Groups (Mathematics), *Matrix algebra, Polynomials.

Stability of compact submanifolds of complex manifolds and some related topics are discussed. A compact submanifold V of a complex manifold W is said to be stable if any small deformation Wt of W contains a small deformation Vt of V. Let psi be the sheaf over V of germs of holomorphic sections of the normal bundle of V in W. If the first cohomology group H1(V,psi) vanishes then V is a stable submanifold of W. A fibre structure of a compact fibred complex manifold M is said to be stable if any small deformation Mt of M retains a fibre structure. If each fibre of M is regular then the fibre structure of M is stable. (Author)

AD-261 409 Div. 15
(17 Aug 61) OTS price $1.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
STORAGE POLICY FOR INCOMPLETE RECORD-KEEPING,
by Herman Chernoff and Gideon Schwarz. 2 July 61, 9p. incl. illus. (Technical rept. no. 71)
(Contract Nonr-22552, Proj. NR-342-022)
Unclassified report

DESCRIPTORS: *Records, Data storage systems, *Mathematical analysis, Probability, Real variables.

AD-261 441 Div. 15
(17 Aug 61) OTS price $1.60

Research Triangle Inst., Durham, N. C.
GROUP-SCREENING WITH MORE THAN TWO STAGES,
by M. S. Patel. 13 July 61, 12p. incl. tables.
(Technical rept. no. 6; Rept. no. S-10)
(Contract DA 01-009-ORD-816, Proj. 2579)
(AROD 2579:6) Unclassified report

DESCRIPTORS: *Factor analysis, Test methods, *Statistical tests, Combinatorial analysis, Design, Probability, *Statistical analysis, Experimental data, Statistical data, Quality control, Statistical distribution, Statistical functions, Sequential analysis, *Sampling.

The two stage group-screening procedure is extended to multiple stages for the case when responses are observed with negligible error. Because of their potential usefulness, three and four stage procedures are treated in some detail. The general n + 1 stage procedure is defined, a formula is developed for the expected number of runs, and for a fixed number of factors is minimized with respect to the sizes of the group-factors at various stages. Finally the procedures at different stages are compared with respect to the minimum expected number of runs. (Author)

AD-261 481 Div. 15
(17 Aug 61) OTS price $1.10

Ohio State U., Research Foundation, Columbus.
MEASURE AND AREA.
Final rept. 15 June 56-14 June 61,
by T. Rado. July 61, 2p., 9 refs.
(Contract DA 33-019-ORD-2114, Proj. 5B99-01-004)
(AROD rept. no. 1685:11) Unclassified report

DESCRIPTORS: *Measure theory, Bibliography, Research program administration.

The original program is described for a project which called for providing adequate foundations in measure theory for application to certain fundamental problems in the theory of surface area. The list of papers that have been published under this project are given. (Author)

AD-261 482 Div. 15
(17 Aug 61) OTS price $1.60

Ottawa U. (Canada).
LOCALLY CONVEX SPACES WITH THE B($\mathcal{J}$)-PROPERTY.
Rept. on Topological Vector Spaces,
by Taqdir Husain. July 61, 17p. 10 refs. (Technical rept. no. 4)
(In cooperation with Syracuse U., N. Y., Contract DA 30-069-ORD-3068, Proj. IB 2-0001(2653))
(AROD rept. no. 2653:4) Unclassified report

DESCRIPTORS: *Topology, Convex sets, Vector analysis, *Functional analysis.

A locally convex topological vector space E is said to have the B($\mathcal{J}$)-property or, in short, to be a B($\mathcal{J}$)-space if, for each t-space F, a linear and continuous mapping f of E onto F is open. If, in addition, f is one-to-one, then E is said to be a Br($\mathcal{J}$)-space. Besides a characterization of B($\mathcal{J}$)-spaces and other results, the following theorems have been proved.
Theorem: Let E be a metrizable locally convex space. Then the dual E' of E with any locally convex topology finer than (E',E) and coarser than $\tau(E',E)$ is a B($\mathcal{J}$)-space. This theorem provides many examples of B($\mathcal{J}$)-spaces which are not B-complete. However, it is easy to see that a B-complete space is a B($\mathcal{J}$)-space. A very general closed graph theorem has been proved from which result the well-known closed graph theorem for B-complete spaces and also the following theorem: Let F be both a t-space and a Br($\mathcal{J}$)-space. Let f be a linear mapping of any locally convex space E into F with the closed graph. If f is almost continuous, then f is continuous. An example is given to show that the above theorem is false if F is not a t-space. (Author)

16. MEDICAL SCIENCES

AD-260 802 Div. 16
(9 Aug 61) OTS price $1.60

Arctic Aeromedical Lab., Fort Wainwright, Alaska.
REACTIVE ERROR IN THE MEASUREMENT OF RECTAL TEMPERATURE IN THE COLD,
by C. J. Eagan. Mar 61, 11p. incl. illus. tables, 10 refs. (Rept. no. AAL TN 59-20)
Unclassified report

DESCRIPTORS: *Body temperature, *Physiology, Theory, Measurement, *Errors, Experimental data, Climatic factors, Mercury, *Thermometers, Heat production (Biology), Exposure.

The reliability of rectal temperatures measured in the cold, using clinical mercury thermometers at various temperatures prior to insertion, has been assessed. It has been shown that the reactive error in measurement may be as great as 1.0 C; the more usual value is approximately 0.3 C. A new term, interactive error, has been defined, as a means of convenient reference to error caused by a general change in the condition of an animal at the time of measurement. The implications of these two types of error to physiological measurements in general has been discussed. (Author)

AD-260 865 Div. 16
(8 Aug 61) OTS price $1.60

Uppsala U. (Sweden).
INVESTIGATIONS OF THE METHODS FOR SEPARATING BIOLOGICALLY AND MEDICALLY IMPORTANT SUBSTANCES OF LARGE MOLECULAR WEIGHT.
Final technical rept. no. 3, 1 June 60-31 May 61,
by Arne Tiselius. 11 June 61, 1v. incl. illus. tables.
(Contract DA 91-591-EUC-1462; Continuation of Contract DA 91-591-EUC-1025)
Unclassified report

DESCRIPTORS: *Proteins, Separation, Viruses, Bacteriophages, *Electrophoresis, *Chromatographic analysis, Test methods, Molecules, Molecular weight, Purification, Microbiology, Biochemistry, Microorganisms, Bacteria, Escherichia, Cells (Biology), Fractionation.

Although the main part of the research work has been directed towards the development and improvement of separation methods, this has been done with much attention to possible applications and many such examples are reported; for example, new possibilities of virus purification, separation of bacteria and other microbiological materials, etc. Some procedures which originally were introduced chiefly for particle separation have been extended also to smaller molecules, whereas other procedures which have their main application in the low molecular-weight field have now been modified to be useful also with large molecules and particles. In both cases a surprisingly high degree of specificity has often been observed. It is believed that the new methods for the separation of biological particles, being both highly specific and comparatively gentle (non-destructive) will prove of value not only for preparative purposes but also as an approach to the study of the micro-structure of biological materials of all kinds. (Author)

AD-261 174 Div. 16
(14 Aug 61) OTS price $1.10

Institute for Cooperative Research, Johns Hopkins U., Baltimore, Md.
STUDIES OF NEUROMUSCULAR FUNCTION.
Interim progress rept. 1 Jan-30 June 61,
by Richard J. Johns, Leroy H. Warthen, and Zelda W. Farley. July 61, 2p.
(Contract DA 18-108-405-cml-120)
Unclassified report

DESCRIPTORS: *Neuromuscular transmission, Acetylcholines, Cholinesterase, Inhibition, Electrolytes (Physiology), Physiology, Drugs.

Investigations are in progress to determine the nature of the block in neuro-muscular transmission produced by depolarizing substances such as acetylcholine, which accumulates at the motor end-plate region in anticholinesterase intoxication. The study of the mechanism of block produced by anticholinesterase agent has been modified so that anticholinesterase drug is administered in vivo and studies are made of serum and muscle electrolytes, neuromuscular transmission, muscle membrane potential, and end-plate potential. If insignificant changes in serum electrolyte concentration occur, radio-sodium and radio-potassium will be used to determine the efflux rate by the pre-loading technique. Another investigation currently under way is the converse of tolerance to anticholinesterase drugs and depolarization, namely, increase susceptibility to the action of depolarizing substances. (Author)

AD-261 185 Div. 16
(14 Aug 61) OTS price $12.00

Army Medical Command, Japan.
(No title).
Annual progress rept. 1 July 60-30 June 61. 30 June 61, 162p. incl. illus. tables.
Unclassified report

DESCRIPTORS: Bibliography, *Schistosomiasis, Immunology, Diagnosis, *Poliomyelitis, Japan, Viruses, Virus diseases, Communicable diseases, Clostridium perfringens, Epidemiology, Infections.

Contents:
Isolation of new viral disease agents
Illustration of medically important arthropods
Bionomics of culex tritaeniorhynchus giles
Development and evaluation of attenuated strains of Japanese encephalitis virus for vaccine purposes
Studies on the immuno-diagnosis and control of schistosomiasis Japonica
When exposed to the infective stages which are the progeny of reciprocal crosses between the human and non-human strains of S. Japonicum
Studies on the biology and control of Schistosoma Japonicum
The possible role of Iota toxin of type E Clostridium Perfringens in the production of symptomatology similar to hemorrhage fever

AD-261 192 Div. 16
(14 Aug 61) OTS price $1.60

Armed Forces-NRC Committee on Bio-Astronautics, Washington, D. C.
GAS REGENERATION AND FOOD PRODUCTION IN A CLOSED ECOLOGICAL SYSTEM,
by Jack E. Myers and Allan H. Brown. Apr 61, 13p. 22 refs. (Publication no. 893)
Unclassified report

DESCRIPTORS: *Closed cycle ecological systems, *Algae, Culture, Carbon dioxide, Oxygen, Regeneration, *Food, Production, *Photosynthesis.

A consideration of an algal culture as a subsystem for carbon-dioxide removal, oxygen generation, and food production in a closed ecological system is reported. It is an attempt to describe the range of variation of the significant parameters of an algal culture based on data from published laboratory investigations and does not attempt to predict the results which theoretically may be attained in the future. The characteristics of a biological ecosystem are based upon use of algae (specifically, some species of Chlorella). The net accomplishment of the system is the uptake of carbon dioxide and the production of oxygen and organic cell material based upon the process of photosynthesis. An alga is chosen as the photosynthetic plant because of the important considerations of (a) manageability, (b) maximum possible use as food and minimum production of cellulose, and (c) attainable CO2/O2 exchange quotient compatible with the human requirement. (Author)

AD-261 210 Div. 16, 13
(14 Aug 61) OTS price $1.60

Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
(No title).
Quarterly progress rept. 16 Apr-15 June 61,
by R. L. Bunch. 15 June 61, 8p. incl. tables.
(Contract FD 6-404-4982)
Unclassified report

DESCRIPTORS: *Sanitary engineering, *Soils, *Antigens, *Inland waterways, Chemical waste, *Contamination, Ion exchange, Adsorption, Antibodies, Carbon, Purification.

Work undertaken during this quarter included testing various solvents for their ability to desorb the antigenic material of sample C and D from activated carbon. Both samples were eluted

successfully with 60% acetone. This is the first solvent found that desorbs any appreciable amount of either antigen from carbon. This procedure is useful for both column and batch-wise operations and was more effective for sample D than C. It has been possible to recover sample D that has been diluted approximately 1:10,000 with Little Miami River water. Plans should be made to test the column procedure at a field site. A column should be installed above and below the outfall of a known source of these antigens. (Author)

AD-261 233 Div. 16
(15 Aug 61) OTS price $1.60

Arctic Aeromedical Lab., Fort Wainwright, Alaska.
FATTY ACID OXIDATION BY MITOCHONDRIA FROM COLD-FASTED RATS,
by E. J. Masoro and Edith Porter. Apr 61, 11p. incl. illus. table, 15 refs. (AAL TR 60-23)
(Proj. 8237-38; In cooperation with Tufts U. School of Medicine, Boston, Mass.)
Unclassified report

DESCRIPTORS: *Stress (Physiology), *Exposure, *Starvation, Laboratory animals, *Fatty acids, *Metabolism, Liver, Experimental data, Oxidation, Glucose, Biophysics, Pharmacology.

Mitochondria from cold-fasted rats oxidized about as much acetate-1-C14 to C1402 as did mitochondria from control rats when the data were expressed on the basis of dry weight of the mitochondria. This was a most surprising result because liver slices (wet weight basis) and liver homogenates (protein content basis) from cold-fasted rats form far less C1402 from acetate-1-C14 than do similar preparations from control rats. The possible reasons for these differences in results with liver slices and liver homogenates on the one hand and liver mitochondria on the other are discussed. Mitochondria from cold-fasted rats were also found to oxidize palmitate-1-C14 to C1402 as rapidly as the mitochondria from control rats, thereby confirming the results obtained with liver slices. Carbohydrate metabolism failed to promote palmitate oxidation by mitochondria from cold-fasted rats; just the opposite result is obtained with liver slices. The use of mitochondria to study the regulation of multistep metabolic pathways is discussed. (Author)

AD-261 234 Div. 16
(15 Aug 61) OTS price $1.60

Arctic Aeromedical Lab., Fort Wainwright, Alaska.
THERMAL AND METABOLIC RESPONSES OF ARCTIC INDIANS TO A STANDARD MODERATE COLD EXPOSURE AT THE END OF WINTER,
by R. W. Elsner, K. L. Andersen, and L. Hermansen. Apr 61, 11p. incl. illus. tables (AAL TR 60-4)
(Proj. 8240-16)
Unclassified report

DESCRIPTORS: *Stress (Physiology), *Exposure, Arctic regions, Man, *Oxygen consumption, *Body temperature, Measurement, Heat transfer, Physiology, Experimental data, *Metabolism.

Oxygen consumption, skin temperature and rectal temperature during nights of cold exposure were measured in eight Indian men from a remote arctic village who had been similarly studied the previous fall. The metabolic response of the Indians to cold exposure was similar in the spring to that observed in the fall studies. All subjects showed a general increase of about 30% in O2 consumption during the night. In addition, the basal metabolic rate of four subjects measured was slightly above the DuBois standards, as in the fall. A decline in rectal and skin temperatures throughout the night was observed to be similar to that of the same subjects in the fall, with the exception that the surface temperatures of arms and legs were slightly cooler in the spring. It was concluded that, except for a tendency toward heat conservation by cooling of extremities, no metabolic or thermal changes of a seasonal nature had taken place in these subjects during the arctic winter. (Author)

AD-261 235 Div. 16
(15 Aug 61) OTS price $1.60

Arctic Aeromedical Lab., Fort Wainwright, Alaska.
THE EFFECT OF GLYCINE ADMINISTRATION ON HUMAN RESPONSE TO AN ACUTE STANDARDIZED COLD STRESS,
by T. Adams, E. J. Heberling, and R. B. Payne. Apr 61, 12p. incl. illus. tables, 15 refs. (AAL TR 60-19)
Unclassified report

DESCRIPTORS: *Stress (Physiology), *Exposure, *Metabolism, *Glycines, *Hypothermia, Pharmacology, Body temperature, Measurement, Heat transfer, Man, Experimental data.

Glycine (amino-acetic acid) and other calorigenic, dietary adjuncts have received considerable attention recently and have been reported to modify whole body responses to cold exposure and hypothermia. In addition to any pharmacological action, the potential value of glycine and similar materials lies in their ability to provide additional calories to the cooling organism via the mechanism of specific dynamic action. Thirty grams of glycine were administered orally to five volunteer, male subjects who were subsequently exposed nude to an environment of 10 C. Measurements of rectal and extremity surface temperatures and whole body metabolic rates failed to show any statistically significant effects that could be attributed to the influence of glycine, as compared to glucose control measurements, throughout a 1-hour cold exposure. At this level of cold stress and drug dosage, glycine could not be seen to affect cold elicited, physiological responses and its values in mitigating human cold exposure is questioned. Reports of glycine effects for more severe cold stresses or during deep hypothermia may possibly be attributed to a more precipitous rate of heat loss, to a greater degree of cooling, or to other factors. (Author)

AD-261 236 Div. 16
(15 Aug 61) OTS price $1.60

Arctic Aeromedical Lab., Fort Wainwright, Alaska.
A MECHANISTIC STUDY OF THE FAILURE IN LIPOGENESIS INDUCED BY COLD-STRESS,
by E. J. Masoro. Apr 61, 12p. incl. illus. tables, 11 refs. (AAL TR 60-22)
(Proj. 8237-38; In cooperation with Tufts U. School of Medicine, Boston, Mass.)
Unclassified report

DESCRIPTORS: *Stress (Physiology), *Exposure, *Liver, *Metabolism, Glucose, *Fatty acids, Histological sections, Laboratory animals, Experimental data, Starvation.

Liver homogenates for lipogenic studies were prepared from fed rats living at 25 C (control

rats), fed rats exposed at 0 to 2 C for 1 day (cold-fed rats), and fasted rats exposed at 0 to 2 C (cold-fasted rats). Sufficient TPN and isocitrate concentrations were added to yield an optimal TPNH generation for the fatty acids synthesizing system; CoA and HCO3 ion were also present at optimal concentrations. Liver homogenates from cold-fed rats synthesized fatty acids about as well as did homogenates from control rats. This finding contrasts with the almost complete absence of lipogenesis in the liver slice prepared from cold-fed rats. The conclusion is drawn that the failure of lipogenesis in the intact liver cell of the cold-fed rats does not result from the lack of fatty acid synthesizing enzymes, but is the result of an unfavorable cofactor environment. Liver homogenates from cold-fasted rats converted far less acetate-1-C14 to fatty acids than homogenates from control and cold-fed rats. It is concluded that either the concentration of the fatty acid synthesizing enzymes is greatly reduced, or a necessary unknown cofactor is not present at adequate levels in the liver of the cold-fasted rat. (Author)

AD-261 237 Div. 16, 29
(15 Aug 61) OTS price $1.60

Arctic Aeromedical Lab., Fort Wainwright, Alaska.
ARCTIC SURVIVAL RATIONS. VIII. FURTHER EXPERIMENTS ON PERSISTENCE OF ADAPTATION TO CALORIC RESTRICTION,
by D. A. Vaughan, H. F. Drury and others. May 61, 7p. incl. tables (AAL TR 60-30)
(Proj. 8238-1)

Unclassified report

DESCRIPTORS: *Military rations, *Survival, Arctic regions, *Diet, Ketones, Excretion, *Metabolism, Exposure, Biochemistry.

Twelve adult men were divided into two equal groups and for 5 days were fed daily 1000-Calorie diet consisting either of 168 grams of pemmican, or 140 grams of pemmican with 40 grams of sugar. Following a recovery period of 7 days (ad libitum food intake), all men were fed 168 grams of pemmican for another 5-day period. Various blood and urine metabolites were measured during both experimental periods. It was found that these subjects did not exhibit a carry-over effect from one period of semistarvation to the next. Comparisons made on the basis of body weight indicated that overweight subjects maintained higher blood sugar levels and excreted less ketones than did normal subjects. (Author)

AD-261 238 Div. 16
(15 Aug 61) OTS price $1.60

Arctic Aeromedical Lab., Fort Wainwright, Alaska.
METABOLISM OF FATTY ACIDS OF RELATED SUBSTANCES IN ANIMALS EXPOSED TO COLD.
Rept. for 1 Feb-30 Apr 60,
by David Rapport. Apr 61, 16p. incl. tables.
(AAL TN 60-24)
(In cooperation with Tufts U. School of Medicine, Boston, Mass.)

Unclassified report

DESCRIPTORS: *Fatty acids, *Metabolism, *Exposure, Muscles, Acetates, Oxidation, Enzymes, Liver, Coenzymes, *Tissues (Biology), Synthesis, Propionic acids, Experimental data, Laboratory animals, Starvation.

Contents:
Acetate activation by skeletal muscle
Effect of cold acclimation on skeletal muscle metabolism
Effect of cold exposure and fasting on hepatic acetate activation
Acetate activation
Inorganic pyrophosphatase
Effect of cold acclimation on esterification of fatty acids by adipose tissue
Lipogenesis by liver systems
Studies on propionate metabolism

AD-261 239 Div. 16
(15 Aug 61) OTS price $1.60

Arctic Aeromedical Lab., Fort Wainwright, Alaska.
THE ORIGINS OF HEAT LOST FROM EXTREMITIES IN ICE WATER,
by C. J. Eagan. Apr 61, 12p. incl. illus. table.
(AAL TN 60-13)

Unclassified report

DESCRIPTORS: *Heat transfer, Calorimeters, Measurement, *Exposure, Man, Laboratory animals, Theory, Physiology, Hands.

The origins of heat lost during ice-water calorimetry of the human finger for 30 min, and of the rabbit ear for 5 min, have been estimated from experimental measurements combined with theoretical calculations. It is estimated that heat convectively transferred to the immersed extremity by the blood stream supplied 97.5% of total heat lost from the finger of normothermal man, 90% from the ear of the normothermal rabbit, and 95% from the ear of the hyperthermal rabbit. Almost all of the remainder of total heat loss was supplied through cooling of the extremity (local heat debt), although a negligible amount was derived from local metabolism. It is concluded that total heat loss is a suitable criterion of the rate of blood flow when the vascular responses to ice-water immersion are compared in the corresponding fingers of man or in the ears of the rabbit. It is implied that surface temperature is a suitable criterion for comparing rates of blood flow in extremities exposed to cold air. (Author)

AD-261 247 Div. 16
(15 Aug 61) OTS price $1.60

California U., San Francisco. Medical Center.
THE EVALUATION OF INTRAVENOUS FAT IN THE TREATMENT OF ACUTE RADIATION SYNDROME.
Final rept. 1 Jan 59-30 June 61,
by Hugo C. Moeller and Jerome M. Vaeth.
30 June 61, 14p. incl. illus. tables.
(Contract DA 49-007-md-905)

Unclassified report

DESCRIPTORS: *Radiation injuries, Therapy, *Fats, Intravenous feeding, Laboratory animals, X-rays.

In order to test the hypothesis that parenterally administered fat emulsion might be a valuable adjunct in the treatment of the acute radiation syndrome, the rate of survival in rats exposed to total body irradiation and injected intravenously or intraperitoneally with fat emulsion was determined. It appears that large doses of fat emulsion administered to rats after total body irradiation may be detrimental to survival. (Author)

AD-261 288 Div. 16
(15 Aug 61) OTS price $1.10

Utah U. Coll. of Medicine, Salt Lake City.
STUDIES OF THE MECHANISMS OF RESISTANCE TO STRESS.
Rept. for period ending 31 Mar 61,
by Thomas E. Dougherty. 1 July 61, 7p.
(Contract DA 49-007-md-130)
Unclassified report

DESCRIPTORS: *Stress (Physiology), Resistance, Corticosteroids, Amines, Toxicity, Inhibition, Metabolism, Lipids, Reticulo-endothelial system, ACTH, Cholesterol, Thyroid hormones, Steroids, Fevers, Production, Heparin, Biochemistry.

The anti-inflammatory and anti-stress effects of corticosteroids and heparin have been studied in considerable detail. Corticosteroids are believed now to inhibit inflammation and stress by inducing a resistance on the part of cells to the cytotoxic effects of histamine, serotonin and possible other amines. Heparin exerts a similar effect; that is, inhibits the stressful effect of histamine and serotonin release by complexing with these two amines. An important part of the stress response is the influence of stress on the steroids conjugating mechanism. ACTH inhibits conjugation of corticosteroids by two different mechanisms. One - it increases retention time of corticosteroids in hepatic RE cells and inhibits the hepatocyte conjugation. ACTH markedly prolongs the half life of cholesterol in the RE system. Thyroid hormone and analogs of thyroxin apparently act by increasing the availability of cofactors so that hydroxylation of cholesterol in the RES enhances solubility and thereby increases the possibility for bile acid formation and excretion. Newer extremely accurate methods for cholesterol determination on small amounts of blood were developed. Their use in the human is now being evaluated. (Author)

AD-261 361 Div. 16
(17 Aug 61) OTS price $1.60

Brooke Army Medical Center, Fort Sam Houston, Tex.
6X61-13-001, ECOLOGY AND CONTROL OF DISEASE VECTORS AND RESERVOIRS.
Progress rept. for 1 July 60-30 June 61.
30 June 61, 19p.
Unclassified report

DESCRIPTORS: *Ecology, Control, *Snake venom, Poisons, Toxicity, *Chemotherapeutic agents, Tests, Arthropods, Collecting methods, Instrumentation, Effectiveness.

AD-261 404 Div. 16
(17 Aug 61) OTS price $1.10

Pennsylvania U., Philadelphia.
ENZYMATIC STUDIES IN LIVER DISEASE. STUDIES OF THYMOL AND ZINC TURBIDITY TESTS.
Final rept. 30 Nov 50-31 May 60,
by John G. Reinhold. 31 May 61, 3p. 14 refs.
(Contract DA 49-007-md-48)
Unclassified report

DESCRIPTORS: *Liver, *Diseases, Coenzymes, Nicotinic acid, Metabolism, Amides, Carbon tetrachloride, Experimental data, Laboratory animals, Ammonia, Test methods, *Diagnosis, Dehydrogenases.

Following administration of carbon tetrachloride to mice, lowered concentrations of dihydrodiphosphopyridine nucleotides (DPNH) concentrations were observed in liver. Diphosphopyridine nucleotide (DPN) concentrations were unchanged. Ammonium concentrations were the same in injured livers as controls. However, ammonium formation was greater in livers of CCl_4 treated mice, an effect attributed to decreased ammonium removal in part because of impaired glutamic dehydrogenase activity. Addition of DPNH and alpha ketoglutarate, substrates for glutamic dehydrogenase, prevented further accumulation of ammonium in breis of injured livers. DPNH alone was less effective. Patients in hepatic coma tended to have high DPN concentrations in erythrocytes. Therapeutic administration of nicotinic acid was a contributing cause. Tissue breakdown may have provided substrates for increased synthesis. A major source of error in blood and tissue ammonia measurements was identified, namely, decomposition of protein by alkali. A revised method was developed. (Author)

AD-261 440 Div. 16
(17 Aug 61) OTS price $1.10

Pennsylvania U., Philadelphia.
THE ACTION OF DRUGS ON FUNCTION AND PHOSPHORYLASE ACTIVITY OF THE PERFUSED RAT HEART.
Semi-annual rept. 1 Jan-30 June 61,
by Niels Haugaard. 10 July 61, 2p. incl. tables.
(Contract DA 18-108-405-cml-630)
Unclassified report

DESCRIPTORS: *Drugs, Heart, Laboratory animals, Physiology, *Phosphorylases, Blood circulation, Enzymes.

Studies on the action of drugs on heart function and phosphorylase activity are being continued. In studies with the open-chest rat preparation, simultaneous measurements were made of blood pressure, rate and force of contraction and electrical activity of the heart. At the end of a period of observation, the heart was rapidly removed for phosphorylase determination. With this preparation, it is possible to study heart function under conditions closer to those existing in vivo than with the perfused heart. The level of phosphorylase a, under control conditions, is much higher than in the heart perfused with Locke solution (40% compared to 10 to 15% of total phosphorylase). In experiments with open-chest rats, the following were established: (1) ganglion stimulating drugs such as dimethylphenylpiperazinium (DMPP) which release stored tissue catecholamines stimulate the heart and increase the activity of phosphorylase a, (2) injection of acetylcholine in doses sufficient to produce marked bradycardia causes a significant decrease in enzyme activity, and (3) depression of the heart produced by stimulation of the vagus nerve decreases phosphorylase a activity. (Author)

AD-261 447 Div. 16
(18 Aug 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
SOVIET BIOLOGY.
11 July 61, 2p. (AID rept. 61-106; Trans. from Meeting of the Div. of Biological Sciences; Akademiya Nauk SSSR. Vestnik 4:40-45, Apr 61)
Unclassified report

DESCRIPTORS: *Biology, Biophysics, Biochemistry, *USSR, Cosmic rays.

A characteristic feature of the Division's work was the application of modern physical and chemical methods to biological investigations. Numerous laboratories and institutes of the Division participated in the preparation and execution of biological studies on spaceships. Progress was noted in the following areas; metabolic processes in model systems of the coarzevate type; synthesis by plants of a group of amino acids required in the diet of man and animals; structural organization of viruses, bacteriophages, bacteria, and biochemical characteristics of functional cell groups; and the energy state of biopolymers in connection with the transformation of energy in biological systems. A new concept of the structure of ribonucleic acids was formulated on the basis of newly obtained facts, and principles of classification of fibrillary proteins based on their chemical structures were proposed. Study of the action of ionizing radiation on biological specimens established (1) the difference between ribonucleic acid synthesized by irradiated microorganisms and normal ribonucleic acid, (2) the appearance of a new species in the third generation of irradiated plants, (3) the unfavorable effect of irradiation on the brain of animal embryos, and (4) the injurious effects of chronic radiation in small doses on the organism. (Author)

AD-261 452 Div. 16
(18 Aug 61) OTS price $2.60

Science and Tech. Section, Air Information Div., Washington, D. C.
SOVIET LITERATURE ON LIFE SUPPORT SYSTEMS.
Monthly rept. no. 4 for June 61.
7 July 61, 20p. incl. illus. tables, 12 refs.
(AID rept. 61-109)

Unclassified report

DESCRIPTORS: *Space medicine, *Closed cycle ecological systems, Psychology, Physiology, *USSR, Biology, Metabolism, Hypothermia, Weightlessness.

AD-261 497 Div. 16
(17 Aug 61) OTS price $1.60

Naval Radiological Defense Lab., San Francisco, Calif.
THE NON-SPECIFIC ACCEPTANCE OF SKIN TRANSPLANTS BY RADIATION CHIMERAS,
by M. S. Silverman. 10 July 61, 18p. incl. tables, 13 refs. (Research and Development rept. no. NRDL-TR-520)

Unclassified report

DESCRIPTORS: *Skin, *Transplantation, Bone marrow, Immunology, Radiation effects, Tissues (Biology), Tests, Effectiveness, Laboratory animals.

The immunological status of lethally irradiated mice protected against the acute effects of irradiation by the transfusion of rat or allelogenic, parental or isogenic bone marrow was studied using the reaction against skin grafts as the indicator system. The data indicated that the radiation chimeras were immunologically unresponsive animals and were, therefore, able temporarily to accept skin grafts from donors foreign to both the irradiated host and the marrow donor. It was concluded that the ultimate rejection of the skin grafts was the result of the recovery of the host's immune response rather than the result of any contribution of donor marrow cells to the immune system. If the animal survives, a specific tolerance towards the bone marrow donor's skin may develop. A possible alternative hypothesis to explain the persistence of the foreign skin grafts despite deaths from secondary disease is discussed. (Author)

17. METALLURGY

AD-260 945 Div. 17, 1, 26
(9 Aug 61) OTS price $3.60

Ladish Co., Cudahy, Wis.
BERYLLIUM FORGING PROGRAM.
Interim engineering rept. no. 5, on Phase 3, 1 Jan-31 Mar 61,
by A. F. Hayes. 31 Mar 61, 32p. incl. illus.
(Contract AF 33(600)36795)

Unclassified report

DESCRIPTORS: *Beryllium, Forging, Manufacturing methods, Tensile properties, Deformation, Dies, Design, Aircraft, Materials.

Forging tryouts for 4 unclad extrusion forging operations were successfully completed with the expendable hot carbon steel support technique to minimize excessive tensile stresses during forging. Three of the 4 parts to be used for the mechanical property test program are being scheduled for production forging. Minor reductions of cross-sectional area are possible by ring rolling unclad Be, provided precautions are taken to support the Be on all sides at the location where deformation occurs. (Author)

AD-260 973 Div. 17, 26
(10 Aug 61) OTS price $1.10

Chase Brass and Copper Co., Inc., Waterbury, Conn.
THE DEVELOPMENT OF FABRICATING TECHNIQUES FOR PRODUCING HIGH PURITY RHENIUM STRIP 6 x 6 x 0.005 inches.
Quarterly rept. no. 1, 1 July-30 Sep 60,
by A. H. Springmeyer and J. H. Port. 30 Oct 60, 4p.
(Contract NOa(s) 60-6066-f)

Unclassified report

DESCRIPTORS: *Rhenium, Sheets, Processing, Production, Purification, Powder metallurgy, Sintering, Melting, Electron beams, Vacuum furnaces, Rolling mills, Powder metals, Chemical properties, Physical properties.

A total of 7-1/2 lb of high purity Re powder, lot #210, was produced; chemical analysis, screen analysis, and physical measurements are tabulated. About 5 lb of powder were mechanically compacted at 25 ton/sq in. The compacts were vacuum presintered at less than one micron pressure for 3 hr at 1200 C and then sintered by self resistance heating in H at 2700 to 2800 C. The fully sintered compacts were then heliarc welded to form an electrode for electron beam melting into a 1.5-in.-diam ingot. The cast ingot had an average hardness of 317 VHN. The ingot was machined by grinding to remove surface cold shuts and then cut into 3 sections. Sample #1 was induction heated to 1600 to 1700 C and then forged flat in one heat to 1/2in. thickness, on a 2500-lb steam hammer. The sample cracked so severely that further fabrication was not attempted. (Author)

AD-260 979 Div. 17
(10 Aug 61) OTS price $2.75

Dow Metal Products Co., Midland, Mich.
FATIGUE PROPERTIES OF MAGNESIUM ALLOY FORGINGS.
Rept. for 1953-1959, on Materials Analysis and Evaluation Techniques,
by Evan H. Schuette. Dec 60, 112p. incl. illus. tables, 10 refs.
(Contract AF 33(038)22609, Proj. 7360)
(WADD TR 60-854) Unclassified report

DESCRIPTORS: *Magnesium alloys, Forging, Mechanical properties, Fatigue (Mechanics), Aluminum alloys, Magnesium castings, Tests, Stresses, Surface properties, Creep, Test equipment, Beams.

Results are presented of axial-load and flexural fatigue tests on specimens from forged disks of Mg alloys AZ31B, AZ71, AZ80A, and ZK60A, and for comparison with forged disks of QZ66XA Mg alloy and 2014 Al alloy, rolled rod of 2024 Al alloy, and AZ81A, AZ91C, and ZK51A Mg alloy sand castings. Results of supplemental tests on full-scale I-beams in forged Al, and Mg, and sand-cast Mg are added. AZ71, AZ80A, and ZK60A showed fatigue properties superior to AZ31B. Magnesium-alloy forgings compare favorably with Al alloy forgings, - and are superior to Mg alloy castings in the absence of sharp notches. Separately cast Mg alloy test bars gave fatigue results equivalent to those obtained from Mg alloy forgings. In a production casting, however, it appears that fatigue properties may be impaired by the presence of internal stress raisers, which may or may not be visible. (Author)

AD-260 980 Div. 17, 4
(10 Aug 61) OTS price $1.50

Denver Research Inst., Colo.
ANALYSIS OF GASES IN METALS.
Rept. for 1 May 59-30 Apr 60, on Materials Analysis and Evaluation Techniques,
by Josef J. Schmidt-Collerus and Andrew J. Frank. Mar 61, 43p. incl. illus. tables, 14 refs.
(Contract AF 33(616)6381, Proj. 7360)
(WADD TR 60-482) Unclassified report

DESCRIPTORS: *Metals, *Gases, *Chromatographic analysis, Nitrogen, Hydrogen, Oxygen, Carbon compounds, Monoxides, Determination, Feasibility studies.

An investigation was made to determine the feasibility of using gas chromatographic techniques in the determination of N in metals. The resolution of extracted N, H, O, and CO by a molecular sieve 5A chromatographic column is demonstrated. The chromatographic sensitivity is shown to be adequate for part per million determinations. An apparatus which combines gas extraction from metallic samples, gas transfer, and chromatographic analysis is described and recommendations presented for further improvement in system operation. The application of the basic principle for the determination of N in Mg and ingot iron with the developed apparatus was investigated. These determinations gave largely negative results; reasons for the failures are attributed to apparatus shortcomings and corrective measures are proposed. Extension of the analytical method to inert-gas fusion extraction is discussed. (Author)

AD-261 028 Div. 17, 26
(10 Aug 61) OTS price $1.10

Reactive Metals, Inc., Niles, Ohio.
THE MANUFACTURE OF Ti-6Al-4V, Ti-2.5Al-16V AND Ti-8Al-8Zr-1(Ta+Cb) AMENDMENT 3. INVESTIGATION OF WELDABILITY OF ONE-INCH THICK TITANIUM 6Al-4V PLATE.
Bi-monthly rept. no. 27, 25 Nov 60-25 Jan 61, by L. E. Stark, L. J. Bartlo and H. G. Porter. Feb 61, 6p. incl. tables.
(Contract NOa(s) 56-994-c)
Unclassified report

DESCRIPTORS: *Titanium alloys, Aluminum alloys, Vanadium alloys, Metal plates, Sheets, Processing, Welding rod, *Titanium wire, Welding, Tests, Production.

The production of 5000 lb of 1-in. Ti-6Al-4v alloy plate and 4 compositions of Ti welding wire was started. Inert-gas consumable wire welding equipment was assembled and tested. Equipment modifications and clamping fixtures are under construction. (Author)

AD-261 038 Div. 17, 22
(10 Aug 61) OTS price $3.60

Watervliet Arsenal, N. Y.
A METALLURGICAL ANALYSIS OF FOUR HIGH-STRENGTH STEELS (EXTRUDED TUBES),
by C. A. Penrose. Feb 61, 38p. incl. illus. tables (Technical rept. no. WVT RR 6101-I)
(Proj. 482-ORD-59)
Unclassified report

DESCRIPTORS: *Steel tubing, Extrusion, Heat treatment, Mechanical properties, *Metallurgical analysis, Recoilless rifles, Gun barrels, Processing, Tensile properties, Fatigue (Mechanics), Impact shock, Steel, Tests.

Four steels: 4335 silicon modified, 300 MA, 4340 conventionally melted in air, and 4340 vacuum melted were extruded into tubing and heat treated to a yield strength range of 200,000 to 220,000 psi. Room temperature, elevated temperature, tensile and fatigue properties, and transition temperature Charpy impact properties were determined and compared. The 300 MA produced the highest mechanical properties, while the 4335 Si steel fell in second place. The vacuum degassed 4340 was third, while the air-melted 4340 demonstrated the lowest properties of the 4 steels investigated. (Author)

AD-261 131 Div. 17, 25
(14 Aug 61) OTS price $2.60

Ordnance Tank-Automotive Command, Detroit, Mich.
SOME OPTICAL PROPERTIES OF SEVERAL EVAPORATED RARE EARTH METALS,
by David K. Wilburn. 1 Mar 61, 23p. incl. illus. tables, 13 refs. (Rept. no. RR-36)
Unclassified report

DESCRIPTORS: *Rare earth elements, Optics, Metals, Metal coatings, Thin films, Erbium, Gadolinium, Holmium, Terbium, Thulium, Ytterbium, Vapor plating, Metal films.

Rare earth metals of Er, Yb, Ho, Tb, Gd, and Tm were evaporated on quartz and glass substrates as optical film surfaces. Vacuum evaporation techniques and the possible use of these metals as technical ''getters'' is discussed. The optical

properties of subject rare earth metals are presented, as well as data on visible and infrared reflectance. Values of refractive index and extinction coefficient are given for two wavelength values, 0.54 and 0.60 microns. Films of Er and Yb showed high reflectance in the infrared and good atmospheric stability. (Author)

AD-261 179 Div. 17
(14 Aug 61) OTS price $2.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
PROPERTIES OF MAGNESIUM-THORIUM ALLOYS, AN ANNOTATED BIBLIOGRAPHY,
comp. by William L. Hollister. June 61, 21p.
48 refs. (Special bibliography no. SB-61-29)
Unclassified report

DESCRIPTORS: *Bibliography, *Magnesium alloys, Thorium alloys, Physical properties, Tests, Metallurgical analysis.

AD-261 209 Div. 17, 25
(14 Aug 61) OTS price $3.60

Sheffield U. (Gt. Brit.).
THE MAGNETIC PROPERTIES OF THE HEUSLER ALLOYS.
Annual status rept. no. 1, 1 July 60-1 July 61.
1 July 61, 32p. incl. illus. 17 refs.
(Contract DA 91-591-EUC-1497)
Unclassified report

DESCRIPTORS: *Magnetic alloys, Magnetic materials, Ferromagnetism, *Ferromagnetic materials, Preparation, Measurement, Magnetic properties, Heat treatment, Lattices, Crystal structure, Nuclear states, Nuclear structure, Transition temperature, Electron transitions, Copper alloys, Manganese alloys, Antimony alloys, Indium alloys, Tin alloys, Aluminum alloys, Germanium alloys, Yttrium compounds, Atomic structure, Magnetic moments, Phase transitions.

A systematic survey was begun of the intrinsic magnetization of the Heusler alloys. A Sucksmith ring balance suitable for measurements of magnetizations of the order of those of the Heusler alloys was constructed. A simple method of preparation of alloys of the Heusler type was developed and the subsequent heat treatments necessary to retain the ordered Heusler phase at room temperatures investigated. X-ray powder photograph and metallographic techniques have been employed to check the constitution of the alloys at various stages of heat treatment. Samples of the following Heusler alloys are now available for detailed magnetic measurements: Cu2MnSb; Cu2MnIn; Cu2MnSn; Cu2MnAl; Cu2MnGe; Cu2MnY; and Cu2MnIn1/2Sb1/2. (Author)

AD-261 292 Div. 17
(15 Aug 61) OTS price $.50

Defense Metals Information Center, Columbus, Ohio.
REVIEW OF RECENT DEVELOPMENTS IN THE TECHNOLOGY OF NICKEL-BASE AND COBALT-BASE ALLOYS.
Rept. 1 May-31 July 61,
by D. A. Roberts. 4 Aug 61, 4p. (DMIC memo. no. 122)
Unclassified report

DESCRIPTORS: *Nickel alloys, *Cobalt alloys, Processing, Mechanical properties, Dispersion hardening, Powder metallurgy, Powder alloys, Reinforcing materials, Wire, Filament wound construction, Tensile properties.

A new wrought Ni-base super alloy, Udimet 520, was developed which is suitable for jet-engine turbine blades and rotors operating at 1800F. Its mechanical properties are similar to those of Udimet 500, but it has superior hot workability over a wide range of temperatures. Fine high-tensile Rene 41 wire for filament wound construction is being produced. The 0.005-in.-diam wire develops a tensile strength of 340,000 psi, a yield strength of 220,000 psi, and 3% elongation in 10 inches. A practical method for incorporating ultrahigh-strength fibers (Al whiskers) into metal matrices was developed. Fibers, pre-wetted with an alloy by a brazing technique, are mixed with metal powders, extruded, sintered and worked into finished parts.

AD-261 293 Div. 17, 14
(15 Aug 61) OTS price $.50

Defense Metals Information Center, Columbus, Ohio.
REVIEW OF RECENT DEVELOPMENTS ON OXIDATION-RESISTANT COATINGS FOR REFRACTORY METALS,
by W. D. Klopp. 31 July 61, 5p. 11 refs. (DMIC memo. no. 120)
Unclassified report

DESCRIPTORS: *Refractory materials, Metals, Niobium, Tantalum, Molybdenum, Tungsten, *Refractory coatings, Coatings, *Ceramic coatings, *Metal coatings, Aluminum coatings, Vapor plating, Silicides, Effectiveness, Oxidation inhibitors.

Recent developments on oxidation-resistant coatings for Nb, Ta, Mo, and W are reviewed. Vacuum-pack and fluidized-bed processes for applying silicide coatings to Nb alloy by the use of iodine vapor as a carrier are described. The coating rate and protective life of a duplex (Cr-Ti) (Si) coating was increased by employing KF as a carrier during vacuum coating of Nb and Nb alloys. An Al-50 Sn coating for Ta showed good self healing properties, in contrast to most other protective coatings. A duplex Si-Mn pack-cementation coating for Ta gave protection for at least 24 hr at 2700 F. Mo samples siliconized by the fluidized bed and pack-cementation processes employing iodine had lives of about 2 hr at 2700 F and up to 30 min at 3000 F. Duplex silicide-base coatings on Mo applied by pack cementation and consisting of an under coat of Cr or Cr-Al overlaid with Si, Si-Cr, or Si-Cr-Al had lives of 3 to 5 hr at 2900 F. Silicide coatings on W applied by pack cementation have given protection for 10 hr at 3300 F.

AD-261 360 Div. 17, 25
(17 Aug 61) OTS price $4.60

Sheffield U. (Gt. Brit.).
IMPURITIES AND IMPERFECTIONS IN METALS AND SEMICONDUCTORS.
Final technical rept. no. 3, 1 June 60-31 May 61,
by N. H. March and A. M. Murray. 31 May 61,
46p. 19 refs.
(Contract DA 91-591-EUC-1492)
Unclassified report

DESCRIPTORS: Impurities, *Metals, *Semiconductors, *Perturbation theory, Temperature, Ionization, Gas ionization, Density,

Theory, Integral equations, Oscillation, Integral transforms, Partial differential equations, Great Britain.

It is shown how a full perturbation treatment of the Dirac density matrix may be developed as a basis for self-consistent calculations in free-electron metals containing localized defects. The present perturbation series is shown to sum to the well-known result for the case of slowly varying potentials. The application of the present approach to Bloch wave functions rather than plane waves is briefly considered. Friedel's generalized first-order method, applicable to a band structure, may be obtained from the present theory for sufficiently slowly varying potentials. Two specific applications of the theory are made. The first concerns perturbations in a gas of density appropriate to metals, at low temperatures, and the second is to the problem of ionized impurity scattering. Some approximations are considered transcending first-order perturbation theory, with particular reference to positron lifetimes in metals. An explicit attempt to evaluate the second-order perturbation correction for both attractive and repulsive potentials is reported. (Author)

AD-261 449 Div. 17, 26
(18 Aug 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D C.
SOVIET PRECIPITATION-HARDENABLE STAINLESS STEELS.
18 July 61, 2p. (AID rept. 61-108, Trans. from On the Possible Replacement of Thermal Strengthening of X17H710 Steel by Strain Hardening; Izvestiya Vysshikh Uchebnykh Zavedeniy, Chernaya Metallurgiya 4:93-96, 1961)
Unclassified report

DESCRIPTORS: *Stainless steel, Dispersion hardening, Heat treatment, Deformation, USSR, Processing, Hardening.

The article suggests a different thermomechanical method of treatment for X17H7YU steel (Armco 17-7PH). According to present practice this steel is subjected to a 4-step heat treatment. It is first solution-annealed at 1100 C for 2 hr and air cooled. It is then conditioned twice at 700 C for 2 hr followed each time by air cooling. Finally, it is aged at 600 C for 4 hr and air cooled. Treated in this manner, X17H7YU has a notch toughness of 5-8 kg-m/sq cm and a hardness of Rockwell C. The suggested thermomechanical treatment consists of the same solution annealing at 1100 C for 1-2 hr, followed by brine cooling, cold rolling (compression) at room or sub-zero temperature, and aging at 450-600 C followed by brine cooling. This method is especially suitable for parts where cold working is one of the last operations. (Author)

18. MILITARY SCIENCES AND OPERATIONS

AD-260 820 Div. 18, 12, 1, 32
(9 Aug 61) OTS price $7.60

Department of the Army, Washington, D. C.
MISSILES AND VENTURES INTO SPACE 1960-1961 REPORT.
June 61, 81p. incl. illus. (Pamphlet no. 70-5-9)
Unclassified report

DESCRIPTORS: *Bibliography, *Guided missiles, Rockets, *Spaceships, Space probes, Satellites, Lunar probes, *Space flight, Directories, Encyclopedias, Conferences, Symposia, Power supplies, Armed Forces, USSR, *Astronautics.

19. NAVIGATION

AD-261 144 Div. 19, 11, 2
(14 Aug 61) OTS price $2.60

Army Transportation Board, Fort Eustis, Va.
ANTARCTIC TASK FORCE 43. 1960-1961.
Final rept.,
24 Mar 61, 18p. incl. illus. (Rept. no. TCB-61-035-TS)
Unclassified report

DESCRIPTORS: *Tractors, Trafficability, *Antarctic regions, Transportation, Effectiveness, *Navigation, Celestial navigation, Tracked vehicles, *Transportation.

Heavy tractor train traverses can be employed in the Antarctic to transport supplies too heavy for airlift. Daily preventive maintenance is essential to assure the success of any traverse. The Byrd-South Pole Traverse experienced no mechanical breakdowns. (Author)

AD-261 165 Div. 19, 2, 25
(14 Aug 61) OTS price $3.60

Geophysics Corp. of America, Bedford, Mass.
PHASE CURVES AND ALBEDOS OF TERRESTRIAL PLANETS, by G. de Vaucouleurs. June 61, 35p. incl. illus. tables (GCA Technical rept. no. 61-26-A)
(Contract AF 33(616)7413)
Unclassified report

DESCRIPTORS: Solar systems, *Planets, *Albedo (Astronomy), *Space navigation, Space probes, Surfaces, Brightness, Reflection, Light, *Spectrographic data, Tables, Phase studies, Integration, Venus, Earth, Moon, Mars.

This study was undertaken as part of an investigation of navigation within the solar system by optical means. The objective is to evaluate the suitability of various physical phenomena as sources of navigational information and to estimate the accuracy of navigational information obtained by various techniques. The amount of energy received from the planets at various wavelengths is of interest in guidance. For guidance of space probes at large ranges, the total energy flux is the significant quantity. For physical investigations from probes at small ranges the energy flux per unit area, i.e., the reflectivity or albedo of the planet or of small parts of it, is the determinant quantity. In both cases the spectral distribution of the energy is also significant, e.g., to estimate the amount of energy available in a specified spectral range transmitted by a given filter. (Author)

Division 19 - NAVIGATION

AD-261 166 Div. 19, 12, 2
(14 Aug 61) OTS price $1.60

Geophysics Corp. of America, Bedford, Mass.
INVESTIGATION OF PHYSICAL PHENOMENA FOR SPACE NAVIGATION.
Final technical documentary rept. May 60-July 61,
by H. E. Stubbs. Aug 61, 14p.
(Contract AF 33(616)7413, Proj. 9(610-5219))
(ASD TR 61-286) Unclassified report

DESCRIPTORS: Space flight, *Space navigation, Planets, Spaceships, Guidance, *Light homing, *Celestial guidance, Star trackers, Astronomy, Optics, Astrophysics, Solar systems, Astronomical data, Mathematical analysis.

The physical phenomena which may be suitable sources of navigational information for space vehicles travelling within the solar system are studied, and the relationships between measurements of the phenomena and navigational parameters are investigated. The scope is limited to phenomena which can be measured by optical techniques that are totally contained within the space vehicle. In particular, radar, and microwave measurements are excluded. The general plan divides the work into three main tasks: the assembly of physical and astronomical data, mathematical analysis of the relationships between the navigational parameters and measurements of the phenomena, and study of instrumental limitations. (Author)

AD-261 167 Div. 19, 12, 2
(14 Aug 61) OTS price $5.60

Geophysics Corp. of America, Bedford, Mass.
INTERPLANETARY NAVIGATION STUDIES. DIAMETERS OF TERRESTRIAL PLANETS (WITH AN APPENDIX ON THE OUTER PLANETS),
by R. J. Levy and G. de Vaucouleurs. July 61,
54p. incl. illus. tables (GCA Technical rept. no. 61-30-A)
(Contract AF 33(616)7413)
Unclassified report

DESCRIPTORS: Space flight, *Space navigation, Planets, Spaceships, Guidance, *Light homing, Space probes, *Celestial guidance, Astronomy, Optics, Astronomical data, Mathematical analysis, Astrophysics, Star trackers.

Navigation within the solar system by optical means is discussed. The objective of the investigation is to evaluate the suitability of various physical phenomena as sources of navigational information and to estimate the accuracy of navigational information obtained by various techniques. (Author)

AD-261 168 Div. 19, 12, 2
(14 Aug 61) OTS price $2.60

Geophysics Corp., of America, Bedford, Mass.
POSITION AND VELOCITY DETERMINATION WITHIN THE SOLAR SYSTEM FROM MEASUREMENT OF ANGLES BETWEEN CELESTIAL BODIES,
by T. C. Degges and H. E. Stubbs. July 61, 21p.
incl. illus. (GCA Technical rept. no. 61-31-A)
(Contract AF 33(616)7413)
Unclassified report

DESCRIPTORS: Space flight, *Space navigation, Planets, Spaceships, Guidance, *Celestial guidance, Astronomy, Celestial mechanics, Venus, Mars, *Celestial navigation, Astronomical data, Mathematical analysis.

Measurement of small angles between near bodies (planets or asteroids) and stars is used to determine position. Each determination requires observation of two such near bodies and four stars, two stars located at small angular distances from each near body being used. The osculating elements of an orbit are determined from two position measurements, using the planned trajectory as a first approximation. Instantaneous position and velocity are computed. Required accuracy of measurement for Venus and Mars flight is discussed assuming small impulsive midcourse corrections to the trajectory. (Author)

AD-261 169 Div. 19, 12, 2
(14 Aug 61) OTS price $3.60

Geophysics Corp. of America, Bedford, Mass.
INTERPLANETARY NAVIGATION STUDIES. PLANETARY AND STELLAR POSITIONS,
by R. J. Levy. July 61, 33p. incl. illus. tables.
(GCA Technical rept. no. 61-32-A)
(Contract AF 33(616)7413)
Unclassified report

DESCRIPTORS: Space flight, *Space navigation, Planets, Spaceships, Guidance, *Light homing, *Celestial guidance, Star trackers, Astronomy, Optics, Astrophysics, *Celestial mechanics, Astronomical data, Mathematical analysis.

Navigation within the solar system by optical means is discussed. The objective of the investigation is to evaluate the suitability of various physical phenomena as sources of navigational information and to estimate the accuracy of navigational information obtained by various techniques. (Author)

AD-261 170 Div. 19, 12, 2
(14 Aug 61) OTS price $2.60

Geophysics Corp. of America, Bedford, Mass.
OPTICAL REFRACTION IN A PLANETARY ATMOSPHERE WITH APPLICATION TO THE APPARENT DIAMETER OF A PLANET AND TO OCCULTATION,
by Donald H. Menzel. July 61, 22p. incl. illus.
table (GCA Technical rept. no. 61-33-A)
(Contract AF 33(616)7413)
Unclassified report

DESCRIPTORS: *Planetary atmosphere, *Refraction, Stellar eclipses, Space flight, Planets, Spaceships, Guidance, *Light homing, *Celestial guidance, Optics, Astrophysics, *Space navigation, Astronomy, Astronomical data, Mathematical analysis.

Navigation within the solar system by optical means is investigated. The objective of the investigation is to evaluate the suitability of various physical phenomena as sources of navigational information and to estimate the accuracy of navigational information obtained by various techniques. (Author)

AD-261 280 Div. 19, 1
(15 Aug 61) OTS price $3.60

Sperry Gyroscope Co., Great Neck, N. Y.
NAVIGATION SET, AIRCRAFT AN/APN-118( ).
Quarterly progress rept. no. 9, 1 Dec 60-28 Feb 61.
31 Mar 61, 23p. illus. (Rept. no. 3251-3716-9)
(Contract DA 36-039-sc-73274)
Unclassified report

DESCRIPTORS: Army, *Doppler navigation, *Radar navigation, *Doppler radar, Airborne, K Band, Frequency modulation, Radio altimeters, Flight testing, Helicopters, Flight instruments, Microwave equipment, Data processing systems, Klystrons, Design, Military aircraft.

Helicopter flight tests of the AN/APN-118 doppler radar indicated significant improvements since the earlier flight tests. Consistent navigation capability was achieved even through the altitude holes. The low altitude, low velocity operation is not all that is desired, but it is expected that the incorporation of the improved r-f switch and other minor changes will permit satisfactory hovering operation. Altimeter operation was demonstrated in flight for the first time. However, a doppler signal is necessary for the altimeter to work. Further laboratory and possible flight tests are necessary before the altimeter design can be completed. (Author)

20. NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

AD-260 876 Div. 20, 25, 2
(9 Aug 61) OTS price $1.10

Michigan U., Ann Arbor.
COSMIC-RAY INVESTIGATIONS.
Final rept.,
by W. E. Hazen. 30 June 61, 4p.
(Contract Nonr-122407)
Unclassified report

DESCRIPTORS: *Cosmic rays, *Mesons, Cosmic ray telescopes, Nuclear spins, Upper atmosphere, *Nuclear reactions, Pair production, Bremsstrahlung, Electrons, Pions, Earth, Cosmic ray bursts.

AD-260 929 Div. 20, 25
(9 Aug 61) OTS price $3.60

Stanford U., Calif.
ROTATIONAL SPECTRA IN THE NUCLEAR SHELL MODEL,
by Raymond S. Willey. May 61, 28p. (Technical note no. 40)
(Contract AF 49(638)388, Proj. 9750-37500)
(AFOSR-832) Unclassified report

DESCRIPTORS: *Nuclear shell models, Nucleons, Nuclei, *Spectrographic analysis, Mathematical analysis, Operators (Mathematics), Nuclear physics, Quantum mechanics, Brillouin zones.

The relation between two different models used to explain the properties of complex nuclei at low energies is treated. One is the nuclear shell model which starts from the picture of nucleons moving independently of each other in a central potential which represents the average effect of all the interactions between the different nucleons. The second is the collective rotational model which pictures the nucleus as a rigid body deformed from spherical shape. The free rotation of this rigid body leads to rotational spectra E equals a constant + L(L+1)/2I. The problem is solved of how to introduce an extra (residual) interaction between particles into the shell model Hamiltonian to obtain rotational spectra within the framework of a shell model calculation. (Author)

AD-260 954 Div. 20, 8, 14, 17, 12
(10 Aug 61) OTS price $2.60

Radiation Effects Information Center, Columbus, Ohio.
MONTHLY ACCESSION LIST 48.
Rept. for 1-30 June 61.
15 July 61, 23p. 54 refs. (REIC Accession List no. 48)
(Contract AF 33(616)7375, Proj. 1448)
Unclassified report

DESCRIPTORS: *Bibliography, *Radiation effects, Dosimeters, Electronics, Space environmental conditions, Space flight, Metals, Ceramic materials, *Radiation damage, Polymers, Dielectrics.

AD-260 958 Div. 20
(10 Aug 61) OTS price $4.60

California U., Berkeley.
A SHAPE-INDEPENDENT THEORY OF HIGH ENERGY NUCLEON-NUCLEON SCATTERING,
by Louis A. P. Balazs. 1961, 44p. incl. illus. tables.
(Contract AF 49(638)327)
(AFOSR-1074) Unclassified report

DESCRIPTORS: Particles, *Nucleons, *Scattering, Nuclear energy levels, Nuclear physics, Nuclear reactions, *Quantum mechanics, Operators (Mathematics), Nuclear spin, Nuclear forces, Special functions, Quantum statistics.

A shape-independent formula for nucleon-nucleon phase shifts, approximately valid over wide energy ranges is derived, assuming only general properties of the wave function and potential. It is found to approximately reproduce the S, P, and D proton-proton phase shifts in the ranges 10-150 Mev and 10-310 Mev with two, or at most three, free parameters per state. A generalization, which includes part or all of the outer potential exactly, is derived at the same time. (Author)

AD-260 959 Div. 20
(10 Aug 61) OTS price $1.10

California U., Berkeley.
CROSS SECTIONS AT HIGH ENERGIES,
by Steven Weinberg. 1961, 9p.
(Contracts AF 49(638)327 and Nonr-22260)
(AFOSR-1075) Unclassified report

DESCRIPTORS: Particles, *Scattering, *Nuclear reactions, Quantum mechanics, *Inelastic scattering, Probability.

AD-261 065 Div. 20
(11 Aug 61) OTS price $14.00

Ballistic Research Labs., Aberdeen Proving Ground, Md.
THE TRANSMISSION OF MONOENERGETIC NEUTRONS THROUGH POLYETHYLENE. MACHINE CALCULATIONS,
by Frank J. Allen, Arnold Flutterer, and others.
Apr 61, 211p. incl. tables (BRL rept. no. 1130)
(Proj. 512-10-001)
Unclassified report

DESCRIPTORS: Diffusion, *Transport properties, *Neutrons, *Ethylenes, Polymers, Boron com-

pounds, Carbides, *Numerical methods and procedures, Digital computers, Programming, Tables, Shielding.

Detailed results of calculations of the transport of monoenergetic neutrons through plane, laterally infinite, slabs of polyethylene containing eight percent boron carbide by weight are given. The results consist of machine printouts and are in tabular form. Less extensive results are given for pure polyethylene. The calculations were made by the Monte Carlo method. Sufficient descriptive material is presented so that the printouts can be understood. However, a description of the machine program along with graphs and discussion of the principal results extracted from the machine printouts have been published in a separate report, BRL 1129. This arrangement was selected because of the great bulk of the machine results. (Author)

AD-261 082 Div. 20, 25
(11 Aug 61) OTS price $1.60

Florida U., Gainesville.
THE NUCLEAR PROPERTIES OF RHENIUM.
Quarterly technical progress rept. no. 3, 8 June-8 Sep 60,
by John A. Wethington, Jr., R. A. Karam and others. 8 Sep 60, 13p. incl. illus.
(Contract NOa(s) 60-6021-c)
Unclassified report

DESCRIPTORS: *Rhenium, Nuclear reactions, *Radioactive decay, *Radioactive isotopes, Beta ray spectroscopy, Gamma ray spectroscopy, Half life, Gamma rays, Neutron activation, Gold.

Spectra from the decay of Re-186 and Re-187 agree generally with the decay schemes given in the literature. In addition, the spectra showed three gamma quanta associated with the isomeric transition of Re-188. The energies of these gamma rays are 105, 92, and 64 Kev, and all have a half-life of 19 min. Disagreement about the fraction of 155 Kev gamma emitted per disintegration of Re-188 plus the large values obtained for the activation cross section when either value was used indicate that the decay scheme of Re-188 is not adequately known. (Author)

AD-261 091 Div. 20
(11 Aug 61) OTS price $6.60

Enrico Fermi Inst. for Nuclear Studies, U. of Chicago, Ill.
COSMIC RAY PRODUCTION OF LOW-ENERGY GAMMA RAYS,
by Frank C. Jones. Jan 61, 67p. incl. illus. 50 refs. (Rept. no. EFINS-61-3)
(Contract AF 18(600)666)
(AFOSR-405)
Unclassified report

DESCRIPTORS: Nuclear physics, *Cosmic rays, *Gamma rays, Upper atmosphere, Mesons, Pions, Photons, Scintillation counters, Measurement, Instrumentation, Balloons, Gamma ray spectrometers.

An attempt has been made to detect and measure any vertically incident flux of low-energy (0.25 to 10 Mev) gamma rays that might be present at high altitudes. The experiment consisted of a series of balloon flights carrying a phoswitch gamma spectrometer with pulse height recording to altitudes of about 5.5 g/sq.cm. atmosphere depth. Directional sensitivity was obtained by placing a lead collimating shield around the detector and by periodically opening and closing a lead shutter above the opening of the shield. At lower altitudes it was observed that gamma rays are generated by cosmic rays in the atmosphere and in the collimating lead shield. There was found convincing evidence that the gamma rays of atmospheric origin were generated by the secondary nucleonic component and that they are not genetically related to the electromagnetic or soft component of the secondary cosmic rays. (Author)

AD-261 116 Div. 20
(11 Aug 61) OTS price $.75

Physics Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
PHOTOCONDUCTIVITY IN CdS CRYSTALS AS A MECHANISM FOR GAMMA RAY DOSIMETRY.
Rept. for Nov 57-Aug 60 on Nuclear Instrumentation,
by O. Van P. Sessoms, III. Nov 60, 23p. incl. illus. 16 refs.
(Proj. 7307)
(WADD TR 60-576)
Unclassified report

DESCRIPTORS: Photoelectric materials, *Cadmium compounds, Sulfides, *Photoconductivity, Gamma rays, Radiation damage, Photoelectric effect (Gamma rays), Dosimeters, Crystals, Measurement, Semiconductors, Electric currents, Detection, Dose rate, Radiation instruments.

Gamma ray induced changes in the conductivity of CdS crystals are studied as a possible mechanism for monitoring gamma dose rates. Data are presented on the change in conductivity due to gamma exposure over a range of 140,000 ergs/g hr (C) to 5 x 10 to the 7th power ergs/g hr (C). The change in photocurrent as a function of voltage at two dose rates is also reported. The rise time of this photocurrent is investigated for photons in the visible light range as well as for Co 60 gamma rays. (Author)

AD-261 124 Div. 20
(10 Aug 61) OTS price $11.50

Pennsylvania U., Philadelphia.
PHOTONUCLEAR ACTIVATION BY 20 MEV GAMMA RAYS,
by Walter DelBianco. 1961, 159p. incl. illus. tables, 113 refs. (Technical rept. no. 9)
(Contract Nonr-55117, Proj. NR 022-019)
Unclassified report

DESCRIPTORS: *Photonuclear reactions, *Nuclear reactions, Radioactivity, *Gamma rays, Iron, Positrons, *Induced radioactivity, Detectors, Radiation counters, Sodium compounds, Iodides, Isotopes, Fluorine, Betatrons, Chromium, Copper, Zinc, Molybdenum, Antimony, Praseodymium, Photons.

The photonuclear activation cross section of elements whose (gamma, n) reaction leads to a suitable positron activity was measured using monochromatic gamma rays from H-3(p, gamma)He-4 reaction. The gamma rays were monitored by a large sodium iodide crystal whose response curve to the gamma rays was measured. The absorption coefficient of these photons in NaI was determined by a good geometry transmission experiment. The positron activity was determined by a coincidence detector, consisting of two 5-in.-diam by 2-in.-long NaI crystals set on the annihilation radiation photopeaks. This detector was calibrated against a F-18 positron source, standardized in

a 2 pi flow counter. The C-12(gamma, n)C-11 and F-19(gamma, n)F-18 reactions were investigated over the energy range from 20.1 to 21.2 Mev. Structure, although reported by other experimenters, was not observed. The (gamma, n) activation cross section was measured at 20.5 Mev for Cr-50, Fe-54, Cu-63, Zn-64, Mo-92, Sb-121, Pr-141, and the results compared with those obtained with betatron experiments. (Author)

AD-261 164 Div. 20, 1
(14 Aug 61) OTS price $1.60

General Dynamics/Fort Worth, Tex.
ARGON ACTIVATION EXPERIMENT. ADDENDUM I,
by D. G. Anderson. 24 July 61, 19p. incl. illus. tables (Rept. no. MR-N-260-1; Addendum to Doc. no. NARF-60-16T and MR-N-260, AD-237 888)
(Contract AF 33(600)38946)
Unclassified report

DESCRIPTORS: Argon, Aircraft, Nuclear propulsion, *Reactor reactivity, Reactor feasibility studies, *Radioactivity, Test reactors, Tests, Thermal neutrons, Radioactive isotopes, Neutron flux density, Shielding, Air, Purification, Diffusion.

Irradiated argon measurements are presented for the aircraft shield test reactor. Results are reported of the initial studies performed on the exhaust effluent from the dry-pool environment (configuration III) of the 3-mw ground test reactor (GTR). With the ASTR in the 2 pi geometry of configuration II, no detectable amounts of argon-41 were present in the air above the reactor at a power level of 2 mw. With the GTR in the irradiation closet of configuration III (4-inch water reflector), an argon activity of 0.5 x 10 to the-10th power microcurie/cc-watt was generated in the dry side of the pool. (Author)

AD-261 190 Div. 20
(14 Aug 61) OTS price $7.60

Naval Research Lab., Washington, D. C.
GAMMA-RAY SCANNING TECHNIQUES FOR FAST BREEDER REACTOR SAFETY STUDIES.
Final rept.,
by L. A. Beach, A. G. Pieper, and M. P. Young. 12 July 61, 71p. incl. illus. tables (NRL rept. no. 5625)
(Contract AT(11-1)607)
Unclassified report

DESCRIPTORS: *Gamma rays, Radiation counters, *Breeder reactors, *Fuel processing, Fuel elements, Fast reactors, Melting, Cameras, *Reactor safety systems, Television display systems, Reactor cores, Gamma emission, Electronic scanners, Gamma counters.

A Radiation Scanning Device was constructed to observe meltdown of fast breeder reactor fuel elements in the TREAT reactor by means of self gamma emission. Although the original desired specification had been to view natural uranium pins with a space resolution of 0.1 in. and a time resolution of 1 millisecond, the system had been designed to give the above space resolution, but the time resolution would be 5 milliseconds or longer depending on the signal intensity. The system failed to give satisfactory pictures because of low signal strength which gave poor contrast against high-strength background from the container required for safety reasons. Measurements indicated that a Mark II system could be constructed to view enriched pins in the standard container with a space resolution of 0.15 in. horizontally and 0.75 in. vertically with a time resolution of 5 milliseconds. (Author)

AD-261 324 Div. 20, 10
(16 Aug 61) OTS price $16.00

Aerojet-General Nucleonics, San Ramon, Calif.
NUCLEAR HYDRAZINE PROGRAM.
Final technical engineering rept. 22 Mar 60-22 Mar 61.
July 61, 233p. incl. illus.
(Contract AF 33(600)40878)
(ASD TR 61-7-840) Unclassified report

DESCRIPTORS: *Hydrazines, Production, Nuclear energy, Chemical reactions, Fission products, Neutron bombardment, Ammonia, Uranium compounds, Dioxides, Synthesis, Research reactors, Production reactors.

A new process is presented for accomplishing chemical reactions utilizing energy from a nuclear reactor in the form of fission fragment irradiation from suspended fissile materials. The production of hydrazine from liquid ammonia was selected as a desirable demonstration of the fission fragment irradiation. Fully enriched uranium in the form of micron size uranium dioxide particles was suspended in liquid ammonia and exposed to a neutron flux in the Livermore Pool Type Nuclear Reactor. The resulting hydrazine yield indicated this process is within the range of economic interest. Preliminary production plant design and estimated capital and operating costs are presented based on this experimental yield. These preliminary estimates indicate that a 175 Mw(t) nuclear reactor would produce 52.5 million lb of anhydrous hydrazine per year at an amortized production cost of about 25 cents per pound. (Author)

AD-261 469 Div. 20, 21
(18 Aug 61) OTS price $1.60

General Dynamics/Fort Worth, Tex.
MODERATOR AND SHIELD WATER GRAPHIC CONTROL PANEL FOR THE NARF REACTORS,
by R. G. Deering and B. W. Landborg. 1 Aug 61, 16p. incl. illus. (Document no. NARF-61-20T; MR-N-276)
(Contract AF 33(600)38946)
Unclassified report

DESCRIPTORS: *Control panels, *Test reactors, Research reactors, Nuclear propulsion, Shielding, Instrumentation, *Light water reactors, Control systems, Name plates, Transparent panels, Display systems.

The design, fabrication, and operation of a graphic-control and function-display panel for the reactor moderator- and shield-water systems of the Nuclear Aerospace Research Facility (NARF) are described. The panel logically presents all physical and dynamic features pertaining to the transfer and storage of moderator and shield water in the NARF reactor complex. This panel features the use of electroluminescent lighting and is believed to be the first such application of this unique illumination source for schematic flow representation. (Author)

21. NUCLEAR PROPULSION

No Entries

Division 22 - ORDNANCE
22. ORDNANCE

AD-261 018 Div. 22, 7
(10 Aug 61) OTS price $12.50

Ordnance Mission, White Sands Missile Range, N. Mex.
HONEST JOHN. PRE-PRODUCTION ENVIRONMENTAL TESTING OF GENERATOR SET GASOLINE ENGINE M-25,
by O. T. Linam. July 61, 171p. incl. illus. tables (Technical memo. no. 887)
Unclassified report

DESCRIPTORS: *Artillery rockets, *Generators, *Internal combustion engines, Tests, Test methods, Maintenance, Alternating current, Direct current, Climatic factors, Radio interference, Electric power production, Heating, Transportation, Protective coverings, Blankets, Electric insulation, Resistance, Measurement.

Results of performance, road, climatic and environmental tests on the M-25 generator set were presented. The primary purpose of these tests was to determine conformance to the specifications and requirements stated in the military purchase descriptions (MPD). The generator set met the MDP in general; however, certain deficiencies were noted. WSMR recommends that production of the generator set be continued after recommended corrections have been accomplished. (Author)

AD-261 019 Div. 22
(10 Aug 61) OTS price $1.60

Ogden Air Materiel Area, Hill Air Force Base, Utah.
SHELF LIFE TEST OF CHARGE JETTISON, LAU-6/A. Airmunitions test rept.,
by Kenneth A. Kartchner. July 61, 15p. incl. illus. table (Rept. no. OOY TR 61-33)
Unclasssified report

DESCRIPTORS: *Destructors, *Rocket launchers, Jet fighters, Life expectancy, Pressure, Tests, Test methods, Release mechanisms, Explosive bolts, Storage.

This test was initiated to obtain data to determine if the shelf life of the charge jettison LAU-6/A could be extended. The shelf life is currently four years. The LAU-6/A is used on the rocket launch rail of the F-89J aircraft. The serviceability of the jettison charge was determined by function testing 20 charges which had been in storage from 38 to 55 months. The resistance of the squib circuit and the strength of blast pressure generated, were measured when the charges were functioned. The blast pressure was measured by using 20 psi Wiancko pressure transducers. The average resistance of the squib circuits was 8.42 ohms, with a variation of 6.8 ohms. The average pressure one foot from the end of the charge was 9.91 psi, and the average pressure one foot below the charge was 15.09 psi. All jettison charges functioned normally. The pressure from the charges was approximately five times the theoretical amount required to shatter the bolt. It is recommended that the shelf life of the charge jettison LAU-6/A be extended to five years. (Author)

AD-261 157 Div. 22, 2, 9
(24 Aug 61) OTS price $3.60

Frankford Arsenal, Philadelphia, Pa.
SURFACE WIND CORRECTION CONSIDERATIONS IN TANK FIRE CONTROL,
by Ira I. Goldberg and S. Sorin. May 61, 33p. incl. illus. tables (Memo. rept. no. M61-30-1)
Unclassified report

DESCRIPTORS: *Fire control, *Exterior ballistics, *Projectiles, Wind, Errors, Meteorology, Mathematical analysis, *Armored vehicles, Reduction, Atmosphere, Gunnery, Errors.

The importance of appropriate surface wind correction for conventional tank gunnery, the complexities involved in estimating surface wind behavior, and a suggested method for converting surface wind data into crosswind relative to the gun tube are discussed. Development of a simple gross crosswind correction system is recommended as an interim solution for use on those occasions when the wind velocity is high and gross corrections are desirable. The conclusion is drawn that further work on a precise system should await the development of an accurate method for determining wind velocity along the trajectory of a projectile. (Author)

AD-261 158 Div. 22, 30
(14 Aug 61) OTS price $5.60

Denver Research Inst., Colo.
RESEARCH AND DEVELOPMENT LEADING TO PERFECTION OF INSTRUMENTATION OF ELECTRO-EXPLOSIVE DEVICES. Quarterly rept. no. 1, 27 Dec 60-30 June 61,
by T. N. Grigsby, J. E. Nunnally and others. 30 June 61, 55p. incl. illus. tables, 12 refs. (Rept. no. DRI 2006)
(Contract N178-7818)
Unclassified report

DESCRIPTORS: *Electric detonators, Thermocouples, Thermoelectricity, Tests, Radiofrequency, Electric bridges, *Instrumentation, Thermionic emission, Test equipment, Electromagnetic waves, Wave transmission, Hazards, *Electric igniters, Ultra high frequency, Impedance, Temperature, Heat transfer, Microwave frequency, Detectors.

Efforts are being devoted toward the development of a good squib simulator or instrumented electro-explosive device. This requires precise knowledge of thermal and rf characteristics of the electro-explosive device. Laboratory equipment to measure these characteristics is needed so that the instrumented EED can be tested continually as it is developed. For that reason, equipment like the precision Wheatstone bridge has been built to measure average bridge wire temperature. The bridge has been used to obtain thermal characteristics of EED's with and without instrumentation and to provide information pertaining to heat transfer mechanisms from bridge wire to sensor. Measurements of thermal parameters of uninstrumented and thermocouple instrumented Mk 1 squibs are described and results discussed. Data from impedance measurements on the Mk 1 squib and Mk 2 ignition element at uhf and microwave frequencies are given. Use of Wheatstone bridge techniques to measure average squib bridge wire temperature rise caused by uhf and microwave excitations is described and preliminary results are presented. (Author)

AD-261 162 Div. 22, 14
(14 Aug 61) OTS price $9.60

Pitman-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.
AN INVESTIGATION OF IMPROVED THRUSTER DAMPER MEDIA FOR OPERATION AT HIGH TEMPERATURES. LIQUID PHASE, PART I.
by F. A. Warren. Apr 61, 109p. incl. illus. tables, 255 refs. (FA rept. no. M61-21-1)

(In cooperation with Southwest Research Institutes, Contract DAI 23-072-507-ORD-(F)-11)
(WADD TR 60-454, pt. 1) Unclassified report

DESCRIPTORS: *Explosive actuators, Damping, Liquids, Encapsulation, Silanes, Gels, Clays, Containers, Calcium compounds, Alginates, Films, Thermal expansion, Hydraulic fluids.

A study is being conducted of (1) thruster damping fluids for operation at temperatures in excess of 200 F and (2) prevention of leakage by encapsulation. Damping fluid encapsulated in spherical capsules of approximately 1/4 in. diameter, either as discrete particles or compressed into a cellular structure, appeared to have potential as a particularly effective leakage preventative. Multicellular masses offer another way to provide a compartmented container fon the damping fluid. Silanes, chain-type dibasic acid esters, organic phosphates, ferrocenes, and sodium potassium alloy (in addition to the silicones) possess characteristics which make them attractive as potential damping fluids. Aqueous and nonaqueous clay suspensions possess desirable characteristics as possible damping fluids. One oleophilic gel remained viscous at 338 F. The volumetric expansion of Dow-Corning Silicone Fluid 200 was measured and an apparatus constructed to establish the safe-filling limits for thrusters containing this fluid. (Author)

AD-261 180 Div. 22
(14 Aug 61) OTS price $1.60

Lake City Arsenal, Independence, Mo.
INVESTIGATION OF CASE STRETCH OCCURRING IN LOT LC 22-103A DURING M61 GUN ACCEPTANCE TESTS AT GENERAL ELECTRIC COMPANY.
Rept. for Apr-July 59,
by Webster P. Taylor and W. L. Smith. July 61, 16p. incl. tables (IED rept. no. 61-10)
(Proj. OAC 58-69)
Unclassified report

DESCRIPTORS: *Cartridge cases, Automatic weapons, *Cartridges, Rupture, Tests, Test methods, *Ammunition, Interior ballistics.

During M61 gun acceptance tests in February, 1959, severe case stretches and four complete circumferential ruptures occurred in firing ammunition Lot LC 22-103A, cartridge, ball, 20mm, M55A1. Several meetings were conducted relative to the problem of case stretch in the M61 gun. General conclusions reached at these meetings were to the effect that the problem was basically one of weapon design and not ammunition. The results of the IED tests on Lot LC 22-103A indicate that the case stretch conditions observed at the General Electric plant were affected by the rate of fire and lubrication. Neither of these conditions could be regarded as sufficiently constant to assure reproducibility of results. It is therefore believed that the stretched case condition in the lot in question was the result of conditions peculiar to the particular weapons involved, particularly since tests conducted at other facilities using the same ammunition lot but different weapons did not in all cases produce the same results. (Author)

AD-261 268 Div. 22, 30
(14 Aug 61) OTS price $8.60

Raymond Engineering Lab., Inc., Middletown, Conn.
THE ANALYSIS, MODIFICATION AND TEST OF A TORSIONAL HAIRSPRING ESCAPEMENT.
Final rept. on Phase 1,
by Charles M. Saltsman, Jr., and George W. Coxeter. 11 Aug 61, 99p. incl. illus. (Rept. no. 593-9)
(Contract DA 36-038-ORD-21198-M)
Unclassified report

DESCRIPTORS: *Clock delay mechanisms, Tests, Design, Theory, Materials, Lubrication, *Time interval counters, Manufacturing methods, Fuzes.

Research is reported on the analysis, modification and testing of a Frankford Arsenal designed torsional hairspring escapement mechanism for use as the governing mechanism in a spring driven gear train. The mechanism was to be considered accurate if the lever frequency variation did not exceed + or - 0.2%. A theoretical discussion of this type of escapement is presented as well as an outline of the approach taken to solve its difficulties. Testing done during Phase I was restricted to bench tests. As a result of these tests it may be stated that the escapement does have the required accuracy under these conditions. (Author)

AD-261 349 Div. 22
(16 Aug 61) OTS price $1.60

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
SYSTEMS ANALYSIS OF CLOVER CARTRIDGE,
by David J. Edelman and Seymour M. Kaye. July 61, 19p. incl. illus. tables (Technical note no. FRL TN 28)
(Proj. TS5-5407)
Unclassified report

DESCRIPTORS: Cartridges, *Photoflash cartridges, *Detonation, Tests, Aluminum, Calcium, Perchlorates, Potassium compounds, High altitude, Lead compounds, Azides, Styphnates, Sensitivity, Interior ballistics, Test methods, Heat, X-ray photography.

A systems analysis of the Clover flash cartridge revealed that, of all components present, the lead azide and lead styphnate exhibit the lowest ignition temperatures on furnace heating of test cartridges. Skin temperature during the launching of a Clover cartridge assembly was found to be approximately 120 C, far below the ignition temperature of any of the cartridge components. Additional assemblies were preheated to temperatures of 120 and 140 C, and series fired. Cartridge skin temperatures of 200 and 270 C, respectively, were obtained. All cartridges fired in sequence with no malfunctions. It was thus established that none of the components are prematurely ignited by heat generated during launching. X-ray examination showed no discontinuities in component packing, and 40 ft free fall tests did not cause detonation of cartridges containing FP 790 only. A possible explanation of the premature detonations obtained during series firings is given based upon omission of the black powder/barium chromate expelling charge. (Author)

AD-261 350 Div. 22
(17 Aug 61) OTS price $1.60

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
BURNING CHARACTERISTICS OF HIGH ALTITUDE TRACER

SYSTEMS,
by Anthony Taschler, Bessie Jackson, Jr., and Seymour M. Kaye. May 61, 14p. incl. tables.
(Technical notes no. FRL TN-49)
(Proj. TS5-5407)
Unclassified report

DESCRIPTORS: *Tracers (Ordnance), High altitude, *Luminescence, Calcium, Sodium compounds, Strontium compounds, Nitrates, Simulation, Carbazoles, Nitro radicals, Fuels, Oxidizers, Binders, Polymers, Ethylenes, Pressure, *Combustion, Tests.

An investigation was conducted to determine the luminosity characteristics of tracer systems employing metallic calcium as fuel, sodium or strontium nitrates as oxidants, and polyethylene or tetranitrocarbazole as binders. The time-intensity characteristics of compositions employing calcium as fuel in combination with strontium and sodium nitrates were determined at both ambient pressure and a reduced pressure simulating an altitude of 100,000 feet. The use of polyethylene and tetranitrocarbazole as binders was also investigated. The results of these studies showed that 80/20 calcium/sodium nitrate system to be the best of all the systems tested. Compositions containing strontium nitrate exhibited ignition and propagation difficulties at 100,000 feet. (Author)

AD-261 362 Div. 22
(17 Aug 61) OTS price $1.60

Measurement Systems, Inc., Norwalk, Conn.
QUANTUM DETECTOR FOR MEASUREMENT OF EED BRIDGE WIRE TEMPERATURE RISE.
Monthly progress rept. no. 1, 29 June-31 July 61, 1 Aug 61, 9p. incl. illus. (Rept. no. ER-7022)
(Contract N178-7934)
Unclassified report

DESCRIPTORS: Test equipment, *Detectors, Electromagnetic fields, Temperature, Safety devices, Monitors, Explosives, Electric wire, Measurement, Signal-to-noise ratio, Materials, Cryogenics, Electromagnetic effects, *Electric detonators, *Electric igniters, Cooling, Miniature electronic equipment, Design, Hazards, *Electric bridges.

Research is concerned with the development of a small quantum detector of such size and shape that it can be mounted inside the cavity of an inert or simulated EED (electroexplosive device), such as the MK I Squib, to monitor the temperature rise of the EED bridge wire when the EED is placed in an electromagnetic field. Design objective is to sense a temperature rise in the bridge wire of 2 C above ambient, with a signal-to-noise ratio of 6 db, and a time constant of less than 100 microseconds. Investigations in the following areas were initiated or completed: (1) to determine which types of existing detector materials could be used, (2) to determine optimum signal-to-noise ratios for various detectors as a function of identical detector and bridge wire temperatures, (3) to determine the feasibility of using a cryogenically cooled detector, and (4) to determine type of chopper best suited for this application. (Author)

AD-261 408 Div. 22
(16 Aug 61) OTS price $1.10

Remington Arms Co., Inc., Bridgeport, Conn.
DEVELOPMENT AND MANUFACTURE OF SPECIAL CALIBER .30 ELECTRIC PRIMERS.
Monthly progress rept. no. 2, 1-31 May 61,
by Theodore B. Johnson. 14 June 61, 3p.
(Contract DA 19-020-ORD-5379, Proj. TN1-2702)
Unclassified report

DESCRIPTORS: *Electric primers, Switches, Reliability, Primers, Mixtures, Conductivity, Electrodes, Explosive trains, Production, Tests.

Efforts were devoted to reduce the amount and/or conductivity of the solid residue from the caliber .30 electric primer used in the T-2 switch and to increase the reliability of the primer. Current work has shown that the mixture (XP403) which resulted in the least amount of solid residue is much too powerful; even at the lowest weight that can be charged in the primer the switch case may be cracked or the electrode assembly be pushed out of the switch case. Mixtures with intermediate amounts of residue (XP401) seem more promising in this respect but even then the electrode assembly may be partially separated from the switch case if the crimp is comparatively weak. (Author)

AD-261 479 Div. 22, 14
(18 Aug 61) OTS price $2.60

Naval Ordnance Lab., White Oak, Md.
DEVELOPMENT OF A LIGHTWEIGHT PLASTICS CARTRIDGE CASE.
Final rept. no. 5,
by S. P. Prosen, W. T. Johnson, and F. Robert Barnet. 22 Mar 61, 27p. incl. illus. tables (NOLTR 61-14)
Unclassified report

DESCRIPTORS: *Cartridge cases, *Plastics, Acrylonitriles, Polymers, Butadienes, Tests, Arctic regions, Desert tests, Styrenes, Molding, Processing, *Materials.

A 105 mm lightweight plastics cartridge case consisting of an acrylonitrile-butadiene-styrene (ABS) power sidewall molded into a metal base has been developed. In production quantities it would probably be competitive in price with metallic cases. In arctic, desert and final engineering tests utilizing conventional propellants the case performed well. Minor cracking of the sidewall occurred in the arctic tests and some chambering difficulties occurred in the desert tests. No serious malfunction of firing sequences occurred under any conditions. In laboratory aging tests the acrylonitrile-butadiene-styrene polymer case was found to be fully compatible with the conventional propellants, however it was incompatible with the newer double-base propellants. Linear polyethylene which is compatible with both propellants looks promising as a cartridge case material. (Author)

AD-261 495 Div. 22
(18 Aug 61) OTS price $4.60

Whirlpool Corp., Evansville, Ind.
A TEST OF THE MUZZLE BURST FEATURE OF THE MT T369 FUZE AT VARIOUS MUZZLE VELOCITIES FROM THE 105MM HOWITZER USING T388 EXTENDED RANGE (MODIFIED) PROJECTILES.
Special rept. on MT T369 Fuze Test. 105MM Howitzer Application. Test Dated 21-22 June 61, by C. C. Clarke and Charles W. Haag. 22 June 61, 44p. incl. illus. table.
(Contract DA 33-008-501-ORD-1800)
Unclassified report

DESCRIPTORS: *Projectile fuzes, Tests, Exterior ballistics, Firing mechanisms, Howitzers, Projectiles, *Terminal ballistics, Test methods, Nose fuzes, Gun barrels, Detonation, *Time delay fuzes.

Tests were conducted on the muzzle burst feature of the MT T369 fuze. Twenty-five inert T388 shell were equipped with the MT T369 fuze and tested for direct fire, zero time performance. Twelve rounds were fired at Zone 10 charge and satisfactory muzzle burst fuze functioning was evidenced somewhere between 11.5 and 17 feet from the muzzle on six of the twelve tests. The other six rounds functioned at impact. Four rounds were fired at a charge to give 115% of rated pressure. Each of these performed satisfactorily giving bursts 14 to 17 feet from the muzzle. Five rounds were fired at Zone 10 charge conditioned at 140 F. Each of these functioned properly between 10 and 13 feet from the muzzle. Two rounds at Zone 9 charge and two rounds at Zone 7 charge functioned normally at 6 to 7.5 feet from the muzzle. No definite reasons for the failures were ascertained from the recovered parts of this test. (Author)

AD-261 146 Div. 23, 5
(14 Aug 61) OTS price $1.60

Bureau of Naval Personnel, Washington, D. C.
POST TRAINING LOSS OF RADIOMAN SKILLS,
by A. S. Glickman and J. V. Pavela. June 61, 14p. incl. illus. (Research rept. no. 61-1)
Unclassified report

DESCRIPTORS: *Radio operators, Naval personnel, Effectiveness, *Training.

A survey of graduates of Radioman Class A Schools showed considerable differences in continuous wave (CW) receiving proficiency associated with differences in the amount and kind of CW practice obtained since leaving school. Subjects were all the enlisted men who had graduated from Class A School during the year ending 30 June 1959, and on 3 August 1959 were assigned to ships and shore stations in the Mediterranean area. All of this group completed an experience record form, which revealed that after one year out of school about half of the graduates had not yet been assigned to a regular watch to receive CW. All of the group who were aboard ships were administered a test of CW receiving ability. Half were not able to receive at the level approximating the Class A School graduation requirement, and about two-thirds could not receive at the level required for advancement to RM3. Implications for training practices are discussed. (Author)

23. PERSONNEL AND TRAINING

AD-260 995 Div. 23
(9 Aug 61) OTS price $1.10

Army Infantry Human Research Unit, Fort Benning, Ga.
PLATTRAIN PREMISES AND TRAINING IMPLICATIONS RELATED TO IMPROVING THE TACTICAL PROFICIENCY OF RIFLE PLATOONS,
by John E. Taylor, John B. McKay and others. Apr 59, 6p. (HumRRO Research memo. no. 12)
(In cooperation with Human Resources Research Office, George Washington U.)
Unclassified report

DESCRIPTORS: *Military training, Combat, Analysis, Military personnel, Effectiveness, *Army operations.

Tactical doctrine, combat literature, and the literature of previous research were studied to develop premises and training implications to serve as a base upon which subsequent programs of training research relevant to the rifle platoon could be built. A set of premise statements was presented summarizing those factors which have complicated smooth rifle platoon functioning in the past and probably will complicate smooth functioning in the future. Separate sets of statements outlining the implications of these premises for training the individual platoon member, the platoon and squad leaders, and platoons as units were written. The conclusion is that the foregoing premise statements and their implications for training must be given priority consideration in the development of future training programs involving the rifle platoon, its leaders, and individual members. Analysis of past combat, ROCID doctrine, and pertinent research indicate that the areas pinpointed here are critical ones. This paper does not intend to convey the impression that these areas are the only ones to which training should be devoted. There are a number of other areas, as well as these, in which platoon members, leaders, and platoons as units need to be trained. (Author)

AD-261 241 Div. 23, 28
(15 Aug 61) OTS price $6.60

Applied Psychological Services, Wayne, Pa.
POST-TRAINING PERFORMANCE CRITERION DEVELOPMENT AND APPLICATION. A SELECTIVE REVIEW OF METHODS FOR MEASURING INDIVIDUAL DIFFERENCES IN ON-THE-JOB PERFORMANCE.
by Douglas G. Schultz and Arthur I. Siegel. July 61, 66p. 108 refs.
(Contract Nonr-227900)
Unclassified report

DESCRIPTORS: *Training, *Applied psychology, Job analysis, Factor analysis, Tests, Naval personnel, Reliability, Effectiveness, Standards.

This report considered recent progress in the area and attempted to point up a number of important issues which require investigation and clarification at this time. Job performance appraisal techniques which have been used were discussed. These included production records, interviews and questionnaires, work sample and situation tests, appraisal of executive performance, and rating scales. Criterion analysis was reviewed in terms of intercorrelation and factor analysis, scaling, and reliability, including job performance changes over time. Important current issues in the field of job performance measurement discussed were problems associated with the dimensionality of performance criteria, their selection and evaluation, their predictability, their ultimacy, and the influence of environmental factors. It was concluded that there is need for an integrating conceptual framework to order and organize the field of measuring individual differences in on-the-job performance and to provide a more satisfactory basis for evaluating on-the-job performance. (Author)

Division 24-PHOTOGRAPHY AND OTHER REPRODUCTION PROCESSES

AD-261 330 Div. 23
(17 Aug 61) OTS price $7.60

Boeing Co., Wichita, Kans.
HUMAN REACTION TO LOW FREQUENCY VIBRATION.
Rept. on Research on Low Frequency Vibration Effects on Human Performance,
by Donald L. Parks and F. W. Snyder. 24 July 61, 73p. incl. illus. tables, 79 refs. (Technical rept. no. 1; Document no. D3-3512-1)
(Contract Nonr-299400)
Unclassified report

DESCRIPTORS: Human engineering, *Vibration, *Reaction (Psychology), Low frequency, Stress (Psychology), Stress (Physiology), *Perception, Intensity, Statistical analysis, Tests, Man.

Systematically derived judgments of levels of vertical sinusoidal vibration severity from 1 to 27 cps were obtained under laboratory controlled conditions for each of 16 selected male subjects. These vibration levels were established in terms of four levels defined as Definitely Perceptible, Mildly Annoying, Extremely Annoying and Alarming as acceleration increased for each fixed frequency at a constant rate. The results established four profiles of acceleration from 1 to 27 cps to be used as the vibration frequency and amplitude points in the vibration environment for a series of tests of human performance in the remaining program. Correlation of judgment with velocity, acceleration, and double amplitude according to frequency were noted. A definite correlation between reported body area selectively affected and frequency was also found. As reported in previous studies in the literature, the body is evidently more sensitive to vibration at selected frequencies, suggesting body organ and appendage resonance. (Author)

AD-261 472 Div. 23, 18
(18 Aug 61) OTS price $6.60

Human Resources Research Office, George Washington U., Washington, D. C.
BIBLIOGRAPHY OF REPORTS AS OF 30 JUNE 1961.
July 61, 57p.
Unclassified report

DESCRIPTORS: *Military training, *Psychological warfare, War prisoners, Behavior, Military requirements, *Leadership, Effectiveness, Adjustment (Psychology), Night warfare, Aptitude tests, *Bibliography, *Psychology, Military personnel.

AD-261 486 Div. 23, 6, 30
(18 Aug 61) OTS price $3.60

RCA West Coast Missile and Surface Radar Div., Van Nuys, Calif.
AN/GPS-T2B. RADAR SIGNAL SIMULATOR.
Final technical documentary rept.,
by F. E. Ambler and J. A. Bendar. 31 May 61, 37p. incl. illus.
(Contract AF 33(600)39718)
(WADD TR 61-268) Unclassified report

DESCRIPTORS: Radar signals, Simulation, *Training devices, Radar targets, Radar operators, Search radar, Height finding, Radar jamming, Effectiveness, Design, Tests, Training, *Radar target position simulators, Aerial targets.

A discussion is presented of the areas where the major redesign effort was expended in order to modify the design of the GPS-T2 radar signal simulator. The areas of discussion are, range accuracy, azimuth accuracy, height accuracy, internal trigger, video jitter and general improvements. The greatest improvements were made in the area of height accuracy and over-all system stability. The Simulator has a range accuracy of t or- 1 mile, an azimuth accuracy of t or- 1/4 degree and height accuracy of t or- 2500 ft for ranges up to 120 miles. These accuracies are maintained over a problem operating time of 4 hours. The external trigger has a rise time of 0.1 microsecond, jitter less than 0.1 microsecond and a long-time stability of better than 1%. All controls necessary for alignment were relocated on the front panels. One of the major improvements was the complete redesign of the transmission subassembly. It was concluded that the simulator is designed to the limits of the state of the art using the basic principles established on the original AN/GPS-T2. (Author)

24. PHOTOGRAPHY AND OTHER REPRODUCTION PROCESSES

No Entries

25. PHYSICS

AD-260 804 Div. 25
(8 Aug 61) OTS price $2.60

Brown U. Div. of Applied Mathematics, Providence, R. I.
TWO-DIMENSIONAL ELECTROSTRICTION.
Technical rept. no. 9, Jan-May 61 on Application of Invariance Principles in Continuum Mechanics, by R. J. Knops. May 61, 24p. (Rept. no. DA-4725/9)
(Contract DA 19-020-ORD-4725, Proj. TB2-0001 (1271))
(AROD rept. no. 1271-32) Unclassified report

DESCRIPTORS: Piezoelectric effect, *Dielectrics, Mechanical properties, Elasticity, Stresses, *Electric fields, Mathematical analysis, *Deformation, Complex variables, Series, Partial differential equations.

The two-dimensional theory of linear electrostriction is developed in terms of the complex variable, and contrasted with the classical theory. In particular, a general solution is presented to the problem when several dielectrics of the same elastic properties are bonded together. (Author)

AD-260 809 Div. 25
(8 Aug 61) OTS price $3.60

Brown U. Div. of Applied Mathematics, Providence, R. I.
ELECTROSTRICTIVE DEFORMATION COMPOSITE DIELECTRICS.
Technical rept. no. 10, Jan-May 61 on Application of Invariance Principles in Continuum Mechanics, by Robin J. Knops. June 61, 31p. (Rept. no. DA-4725/10)
(Contract DA 19-020-ORD-4725, Proj. TB2-0001 (1271))
(AROD rept. no. 1271;33) Unclassified report

DESCRIPTORS: *Piezoelectric effects, *Dielectrics, *Mechanical properties, *Elasticity, Stresses, Electric fields, Vector analysis, Tensor analysis, Mathematical analysis, Deformation.

Certain aspects are treated of the three-dimensional theory of electrostriction within the context of elastostatics. Field equations are derived by means of a calculation based on the invariant form of the stress-strain relations, and the restrictions imposed on the magnitude of the electric field by a linear theory and also the conditions under which equations for this field become uncoupled are discussed. The problem is considered of a dielectric embedded in another dielectric in the case when the shear moduli have the same value. In general, the dilatation is not uniform, therefore, neither are the stresses nor strains, although when one of the dielectrics is replaced by a conductor this may no longer be true. The discontinuities in the stress and strain components across the interface separating dielectrics are next examined and expressions for them derived in terms of the electric field. A solution is then presented to the field equations in terms of stress functions analogous to those of Papovich-Neuber, and a separate proof is given for an incompressible medium. (Author)

AD-260 816 Div. 25, 30
(9 Aug 61) OTS price $2.60

Cornell U., Ithaca, N. Y.
THE CONTINUOUS PHOTOELECTRIC ABSORPTION CROSS SECTION OF HELIUM,
by D. J. Baker. July 61, 23p. incl. illus. tables (Technical rept. no. 5)
(Contract Nonr-40137, Proj. NR 017-625)
Unclassified report

DESCRIPTORS: Absorption, *Helium, Optics, *Spectrographic analysis, Photomultipliers, Photoelectric cells, Photoelectric effects, Electromagnetic waves, Attenuation, *X-rays, X-ray absorption analysis, Instrumentation, Laboratory equipment.

AD-260 825 Div. 25, 14
(8 Aug 61) OTS price $5.60

Duke U., Durham, N. C.
DESIGN AND ANALYSIS OF STRUCTURAL ELEMENTS. Final rept.
by Robert S. Rowe and Jehangir F. Mirza. 4 Aug 61, 54p. incl. illus.
(Contract DA 36-034-ORD-2864, Proj. TB4-003)
Unclassified report

DESCRIPTORS: *Structural shells, *Structures, Deformation, Deflection, Stresses, Analysis, Design, Plastics, Resins, Glass textiles, Reinforcing materials, Reinforced concrete, Bodies of revolution, Model tests, Parabolic bodies, Measurement.

Because the exact theoretical solution of warped surfaces is so cumbersome, an experimental investigation was made in order to attempt a correlation between a simplified theory and experimental results. Stresses and displacements were obtained experimentally for warped surfaces and compared with similar flat plates. Results indicate that the axial stresses in a flat plate are of the same order of magnitude as the axial stresses in a hyperbolic paraboloid and that the bending stresses in a flat plate are many times greater than the corresponding stress in a geometrically similar hyperbolic paraboloid. Deflections in a flat plate are an order of magnitude greater than the corresponding deflections in geometrically similar hyperbolic paraboloids. Thus, experimental evidence indicates that a favorable weight to strength ratio may be obtained by slight changes in the design of structural elements by warping the surface. The usual simplified theory for hyperbolic paraboloids has been found unreliable as there is little correlation between theory and experiment. (Author)

AD-260 895 Div. 25
(9 Aug 61) OTS price $1.10

King's Coll., U. of London (Gt. Brit.).
RECURRENT RADIATION IN GENERAL RELATIVITY,
by D. W. Sciama. 20 June 60, 6p. (Technical (scientific) note no. 11)
(Contract AF 61(052)48)
(ARL TN 60-165) Unclassified report

DESCRIPTORS: *Relativity theory, *Gravity, Tensor analysis, Quantum mechanics, *Topology.

Space-times which are recurrent Riemann spaces (in the sense of Ruse and Walker) are examined and their relation to plane wave space-times is described. (Author)

AD-260 915 Div. 25
(9 Aug 61) OTS price $1.10

Pennsylvania State U. Mineral Industries Experiment Station, University Park.
HIGH-PRESSURE PHASE TRANSFORMATIONS IN LABORATORY MECHANICAL MIXERS AND MORTARS,
by Frank Dachille and Rustum Roy. 28 June 61, 6p.
(Technical rept. no. 3, Contribution no. 59-59)
(Contract Nonr-65620)
Unclassified report

DESCRIPTORS: *Phase transitions, *High pressure research, Stirrers, Crystals, Crystal structure, Pressure, Temperature, Calcite, Ceramic materials, Barium compounds, Beryllium compounds, Boron compounds, Calcium compounds, Iron compounds, Lead compounds, Manganese compounds, Antimony compounds, Silicon compounds, Oxides, Sulfates, Grinders, Laboratory equipment, Chemical reactions, Stresses, Hydrostatic pressure, Transformations.

Pressure effects produced by mixing and grinding devices were studied for PbO_2, $CaCO_3$, MnF_2, BeF_2, SiO_2, PbO, Sb_2O_3, B_2O_3, and $BAsO_4$; transition pressures at room temperature were 10,000, 3,000, 9,500, 15,500, 13,500, 5,500, 10,000, 18,500, and 30,000 bars, respectively. Results showed that (1) grinding or mixing in both automatic mortars and Wig-L-Bug-type shakers not only can introduce appreciable amounts of surface and strain energy, but also can generally cause the formation of high-pressure phases; (2) the effective maximum pressures obtainable in such instruments is not less than 15,000 bars; and (3) in addition to the quasi-hydrostatic pressures, shearing stresses effect marked acceleration of the transformations.

AD-260 917 Div. 25
(9 Aug 61) OTS price $1.10

Pennsylvania State U. Mineral Industries Experiment Station, University Park.
HIGH PRESSURE FORMS OF BPO_4 AND $BAsO_4$; QUARTZ ANALOGUES,
by Frank Dachille and L. S. Dent Glasser,
28 June 61, 6p. incl. tables (Technical rept. no. 2; Contribution no. 58-86)
(Contract Nonr-65620)
Unclassified report

DESCRIPTORS: *Boron compounds, *Phosphates, *Arsenic compounds, Crystal structure, Crystals, Quartz crystals, *Single crystals, Silicon compounds, X-ray diffraction analysis, Density, Refractive index, High pressure research, Preparation, Oxides.

Samples of high pressure forms of BPO_4 and $BAsO_4$ were prepared and their powder patterns were found to be in agreement with those of products prepared earlier in this laboratory at higher pressures. Small single crystals were obtained of both materials, which, especially in the BPO_4, were often perfect hexagonal prisms. The unit cells were determined directly, and were analogous to that of quartz; except that the c-axis in each case is doubled. Comparison with c-rotation photographs of quartz showed similar intensity distributions. Powder patterns, refractive index, and density determinations all compared favorably with the earlier research.

AD-260 931 Div. 25, 8
(9 Aug 61) OTS price $1.60

Stanford U., Calif.
THEORETICAL CONSIDERATIONS CONCERNING QUANTIZED MAGNETIC FLUX IN SUPERCONDUCTORS,
by N. Byers and C. N. Yang. June 61, 12p.
(Technical note no. 41)
(Contract AF 49(638)388)
(AFOSR-920)
Unclassified report

DESCRIPTORS: *Superconductors, Magnetic fields, *Quantum mechanics, Electrons, *Solid state physics, Lattices, Magnetism, Low temperature research, *Cryogenics.

Macroscopic flux quantization in superconductors as found by Fairbank and Deaver is shown to be a consequence of well-known quantum mechanical laws. It is further shown that the factor of 2 in quantum unit (hc/2e) is an indication of the pairing of electrons in the superconducting state. The intimate connection between the Meissner effect and flux quantization is discussed. (Author)

AD-260 939 Div. 25, 26, 8
(9 Aug 61) OTS price $4.60

Whirlpool Corp., St. Joseph, Mich.
THERMOELECTRIC TEMPERATURE CONTROL IN AN/URQ-9 FREQUENCY STANDARD.
Interim development rept. no. 1, 1 Apr-30 June 61,
by R. S. Sickert and A. F. Martz. 28 July 61,
49p. incl. illus. tables.
(Contract NObsr-85314)
Unclassified report

DESCRIPTORS: *Crystal ovens, Radiofrequency, Standards, *Thermoelectricity, *Temperature control, *Crystals, Growth, Design, Heat exchangers, Mathematical analysis, Laboratory equipment, *Laboratory furnaces.

This effort summarizes an evaluation of 5 proposed methods for modifying the ovens of the AN/URQ-9 frequency standard and gives the design details of 1 method which was adopted for development. An analysis of the system consisting of the modified ovens and proposed regulators for maintaining temperature is included. The important features of the detail design given herein are: (1) only the crystal is maintained at 25 C + or - 0.01 C, (2) the tank circuit is maintained at 60 C + or - 2 C, (3) the modified ovens will require only 2 or 3 more watts than are required by the ovens presently used in the AN/URQ-9, and (4) only simple modifications need be made in the presently used regulator circuits to regulate the modified unit. (Author)

AD-260 948 Div. 25, 26, 17
(8 Aug 61) OTS price $1.60

Magnetic Materials Lab. Lehigh U., Bethlehem, Pa.
MAGNETIC MATERIALS RESEARCH.
Final rept. 16 Aug 58-14 June 61,
by G. P. Conard, II and E. J. Jablonowski.
5 July 61, 15p. incl. table, 16 refs.
(Contract DA 36-039-sc-78092)
Unclassified report

DESCRIPTORS: *Magnetic materials, Magnetic alloys, Metal films, *Thin films, Production, Nickel, Deposits, Nickel compounds, Chlorides, Reduction, Phosphites, Magnetic properties, Magnetostriction.

Several experiments in electroless deposition of thin Ni films were performed at room temperature and at 78C. Electroless deposition involves the reduction of a metal (Ni) compound by hydrophosphites in a heated solution. The solutions contained 30g/l of NiCl2, 10g/l of NaH_2PO_2, 50g/l of NH_4Cl, 100g/l of sodium citrate, and NH_4OH to a pH of 8 to 10. Substrates were commercially pure Al sheet, degreased and insulated on one side with spray lacquer. No deposits were obtained at room temperature and erratic results were obtained at 78C. When uninsulated Al sheet was used at 80 + or - 3C, a minimum of 3 min was required to plate the entire Al surface with nickel. The Ni deposited on the Al at the rate to 20 to 80 angstroms per min, and deposited on Ni at the rate of 1400 angstroms per minute. Films less than 5000 angstroms thick could not be removed from the substrate. Thicker films were removed by flexing the Al and peeling away the film. The Ni films could not be magnetically saturated in a field of 65 oersteds. The appearance of the B-H curves for the films indicated a high magnetic hardness.

AD-260 997 Div. 25
(10 Aug 61) OTS price $2.60

King's Coll., U. of London (Gt. Brit.).
SURVEY OF GRAVITATIONAL RADIATION THEORY,
by F. A. E. Pirani. 27 June 60, 24p. incl. illus.
(Technical (Scientific)note no. 10)
(Contract AF 61(052)48)
(ARL TN 60-166) Unclassified report

DESCRIPTORS: *Relativity theory, *Gravity, Tensor analysis, Quantum mechanics.

A survey, to early 1960, of the convariant part of gravitational radiation theory is presented. This survey is aimed at at those with a working knowledge of general relativity. Approaches to gravitational radiation problems through weak field and other approximation methods and through the use of special coordinate conditions are not discussed. Most attention is given to (1) the theory of gravitational wave-fronts; (2) the algebraic and differential properties of the Riemann tensor and their implications for wave propagation; (3) exact vacuum metrics representing gravitational waves. It is to be concluded that the present theory gives a good understanding of wave propagation in a wide class of somewhat idealized situations, and some strong indications of the behaviour of actual gravitational radiation fields. The satisfactory development of the theory awaits the discovery of exact vacuum metrics representing radiation from isolated finite systems. (Author)

AD-261 003 Div. 25
(14 Aug 61) OTS price $1.60

Uppsala U. (Sweden).
(No title).
Technical notes.
1961, 29p. incl. tables.
(Contract AF 61(052)351)
(ARL-110) Unclassified report

DESCRIPTORS: *Lithium, Ions, *Electron transitions, Excitation, *Atomic energy levels, Atomic structure, Quantum mechanics, Atomic orbitals, Electrons, Ionization, Mathematical analysis, *Equations of state, Theory.

This rept. includes:
Uppsala U. (Sweden).
APPROXIMATE ANALYTICAL WAVE FUNCTIONS FOR THE 1s2ns 2S1/2 STATES OF Li AND Li-LIKE IONS, by Z. W. Ritter, R. Pauncz, and K. Appel. 15 Apr 61, incl. tables (Technical note no. 62)
(Contract AF 61(052)351)

Energies and wave functions are calculated for some excited states of 3-electron ions. Energy values good to about 1% were obtained without introducing interelectronic coordinates. (Author)

Uppsala U. (Sweden).
COMMENTS ON THE RELATIVISTIC CORRECTIONS AND THE ELECTRONIC CORRELATION IN THE Li-LIKE IONS, by Anders Froman. 1 June 61, 11p. incl. tables.
(Technical note no. 63)
(Contract AF 61(052)351)

Estimated relativistic corrections to the ionization potentials are given. The intershell correlation energy is about 10% of the total correlation energy and is found to be of angular type. (Author)

AD-261 004 Div. 25, 30
(10 Aug 61) OTS price $5.60

Magnetogasdynamics Lab., Mass. Inst. of Tech., Cambridge.
ON THE MAGNETICALLY DRIVEN T-TYPE SHOCK TUBE OF RECTANGULAR GEOMETRY,
by Leonard Y. Cooper. June 61, 53p. incl. illus.
(Rept. no. 61-6)
(Contract AF 19(604)4551)
(AFCRL-687) Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, *Plasma physics, *Shock tubes, Shock waves, Magnetic effects, Hydrogen, Velocity, Pressure, Circuits, Photographic analysis, Design, Tests, Instrumentation, Mathematical analysis, Theory.

The principle of operation of the T-type shock tube is discussed in general. A mathematical model of a shock tube of rectangular geometry is proposed, and a theory of performance is developed for this model. A shock tube is constructed so as to produce phenomena which will correlate to the above model. Experiments are performed on the shock tube using hydrogen as the test gas, and the results are compared with theoretical predictions based on the mathematical model. Excellent agreement of the experiments and theory is obtained for low shock velocities. The assumed nature of the current flow in the shock tube is verified. (Author)

AD-261 044 Div. 25, 17
(8 Aug 61) OTS price $9.10

Utah U., Salt Lake City.
TRANSPORT AND DEPOSITION OF METALLIC IONS IN ALPHA-QUARTZ,
by H. Vanfleet, G. S. Baker and P. Gibbs.
15 July 61, 95p. incl. illus. (Technical rept. no. 15)
(Contract Nonr-128803, Proj. NR-032-168)
Unclassified report

DESCRIPTORS: *Solid state physics, *Quartz crystals, Crystal structure, *Microstructure, Crystals, Lattices, Electric fields, *Ions, Diffusion, Surfaces, Transport properties, Nucleation, *Silver, Electrodes, Metals, Conductors.

Four distinct types of optical decorations resulted from manipulating a negatively charged microprobe over the (0001) face of a silver

backed quartz crystal at temperatures between 300-573 C. The most prominent of these decorations was the formation of conducting metallic platelets on the basal plane of the crystal in the vicinity of the probe. These platelets were of uniform thickness, about .4 of a micron, with surface areas ranging up to the dimensions of the anode. Geometric patterns showing the six-fold symmetry of the basal plane were observed to form, at or near the crystal surface, within a fraction of a second upon the application of a negative probe to the (0001) face. Probe currents, both axial and equatorial, were found to be thermally activated with energies of 38 Kcal/Mole for conduction not involving the transport of silver ions. (Author)

AD-261 050 Div. 25
(23 Aug 61) OTS price $1.60

Gordon McKay Lab. of Applied Science, Harvard U., Cambridge, Mass.
(No title).
Final rept.,
by R. V. Jones. 5 Apr 61, 16p. 31 refs. (Scientific rept. no. 18)
(Contract AF 19(604)1084)
(AFCRL-508) Unclassified report

DESCRIPTORS: Bibliography, *Ferrites, Ferromagnetism, *Ferromagnetic materials, Physical properties, Microwave equipment, Measurement.

Abstracts of the following scientific reports are presented: (1) Initial permeability spectra in ferrites and garnets, by J. E. Pippin and C. L. Hogan; (2) Frequency doubling and mixing in ferrites, by J. E. Pippin; (3) Harmonic generation and frequency mixing in ferromagnetic insulators, by R. L. Jepson; (4) Ferromagnetic resonance in metal single crystals, by J. O. Artman; (5) The elements of nonreciprocal microwave devices, by C. L. Hogan; (6) The low-frequency problem in the design of microwave gyrators and associated elements, by C. L. Hogan; (7) The force on an anisotropic paramagnetic crystal in an inhomogeneous magnetic field, by W. P. Wolf; (8) The effect of crystalline electric fields on ferromagnetic anisotropy, by W. P. Wolf; (9) The preparation of polycrystalline ferrites for microwave applications, by J. E. Pippin and C. L. Hogan; (10) Resonance measurements on nickel-cobalt ferrites as a function of temperature and on nickel ferrite-aluminates, by J. E. Pippin and C. L. Hogan; (11) Ferrimagnetic resonance in some polycrystalline rare earth garnets, by G. P. Rodrigue, et al; (12) Microwave properties and applications of garnet materials, by G. P. Rodrigue; (13) The heat capacities of seven rare earth ethylsulphates at low temperatures, by H. Meyer and P. L. Smith; and (14) Thermal and magnetic properties of praseodymium ethylsulphate below 1 K, by H. Meyer.

AD-261 088 Div. 25, 2
(11 Aug 61) OTS price $3.60

Enrico Fermi Inst. for Nuclear Studies, U. of Chicago, Ill.
THE DISTRIBUTION OF TRAPPED PARTICLES IN A CHANGING MAGNETIC FIELD,
by E. N. Parker. Feb 61, 32p. illus. 10 refs.
(Rept. no. EFINS 61-9)
(Contract AF 18(600)666)
(AFOSR-402) Unclassified report

DESCRIPTORS: Magnetohydrodynamics, *Van Allen radiation belt, *Terrestrial magnetism, Particles, *Particle trajectories, Magnetic fields, Density, Distribution, Integral equations, Mathematical analysis, Solar disturbances.

The redistribution of charged particles in the mirror field $B(s,t) = B_0 T(t)\{1 + [s/a(t)]^{\nu(t)}\}$ is worked out for slow changes in $T(t)$, $a(t)$, and $\nu(t)$. It is found that increasing $T(t)$ gives a relatively greater particle density increase in the center of the field than deep in the mirrors $s \gg a(t)$. The mirror distance retracts like $1/T^{1/(\nu+2)}$. Decreasing $a(t)$ has the opposite effect. Field variations constrained to preserve $T(t)a^2(t)$ and $\nu(t)$ leave the form of the particle distribution unchanged, increasing the density everywhere by the same factor. Comparing the theoretical results with the analysis by Fan, Meyer, and Simpson (J. Geophys. Research, 66, 1961) of the large changes in the outer Van Allen radiation zone during the magnetic activity of August 1960 shows that the changes in the particle density can be explained by a small increase of $T(t)$ with $a(t)$ fixed, and later by a decrease of $a(t)$ so that $T(t)a^2(t)$ approximates to its initial value. No irreversible particle injection or acceleration appears necessary to explain the changes in the radiation zone. (Author)

AD-261 090 Div. 25, 2
(11 Aug 61) OTS price $1.60

Enrico Fermi Inst. for Nuclear Studies, U. of Chicago, Ill.
HYDROSTATIC PROPERTIES OF AN IONIZED ATMOSPHERE,
by E. N. Parker. Feb 61, 15p. illus. (Rept. no. EFINS-61-14)
(Contract AF 18(600)666)
(AFOSR-404) Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, *Solar corona, Ionization, Helium, Hydrogen, *Solar atmosphere, Atmosphere, Electrostatic fields, Ions, Heating, Mathematical analysis, Solar disturbances, Protons.

It is shown that the electrostatic field in an ionized atmosphere causes ions of different charge and mass to concentrate at different levels. Thus, for instance, if the solar corona is sufficiently quiet as to permit an approach to equilibrium, its composition is stratified and not at all typical of the true solar composition. On the other hand, in the presence of sufficient stirring to maintain chemical homogeneity it is shown that the settling of helium ions through the hydrogen corona toward their lower equilibrium level is a powerful heating mechanism. It is shown that the ionized atmosphere of a hypothetical helium star will eject protons into space with a velocity of the order of the gravitational escape velocity (energies of the order of kilovolts). (Author)

AD-261 096 Div. 25, 20
(11 Aug 61) OTS price $1.60

Midwest Research Inst., Kansas City, Mo.
DEVELOPMENT OF SYSTEMS FOR AUTOMATIC, REVERS-

IBLE CONTROL OF INTENSITY OF VISIBLE RADIATION THROUGH TRANSPARENT MATERIALS.
Progress rept. no. 2, 1 Apr-30 June 61,
by Florence I. Metz. 11 July 61, 20p. incl. illus. tables.
(Contract NOw 61-0587-d)
Unclassified report

DESCRIPTORS: *Optical filters, *Optical materials, *Thin films, *Semiconducting films, Shielding, Light, Light transmission, Absorption, Reflection, Dyes, Organic solvents, Electric fields, Temperature, Atomic bomb explosions, Nuclear explosions, Solutions.

Study of ZnO films showed that films 400 angstroms thick prepared by rapid evaporation of ZnO powder exhibited the highest reflectance in the 2 to 15 micron range. Excitation by selected bands of energy in the UV region did not alter fatigue characteristics of N-(3-pyridyl) sydnone. Filters composed of an inorganic semiconductor and an UV absorber were examined; the UV film enhanced the reflectivity of the optical filter and the UV excitation caused a shift to shorter wavelengths of the reflection edge in the near IR and visible region. Composite filters with UV absorber and sydnone showed limited response to UV excitation. Electrochromic dye studies are discussed; a dihydropyridine was strongly thermochromic.

AD-261 112 Div. 25
(11 Aug 61) OTS price $3.60

Stanford Electronics Labs., Stanford U., Calif.
THE TRANSIENT BEHAVIOR OF CONDUCTIVITY IN PHOTOCONDUCTORS,
by I. Wunderman. 28 June 61, 34p. incl. illus.
(Technical rept. no. 1511-1)
(Contracts Nonr-22544, Proj. NR 375 865 and Nonr-22524, Proj. NR 373 360)
Unclassified report

DESCRIPTORS: Conductivity, Measurement, *Photoconductivity, *Photoelectric materials, Transients, Test equipment, Light, Tests, Life expectancy, Semiconductors, Mathematical analysis, *Infrared photoconductors, Theory, Equations, Thin films, Electron transitions, Cadmium compounds, Selenides, Sulfur compounds.

Research was concerned with measuring and understanding the variations of electrical conductivity with time in a sintered-layer cadmium-sulfoselenide photoconductor. Primary interest was focused on the decay of conductivity after a known illuminating source is suddenly removed. Suitable apparatus was assembled to perform the necessary measurements. The techniques employed and the associated limitations are discussed. A study of the basic photoconductivity mechanism in photoconductors was undertaken, and several theories were tested. A physical model was found which can explain the salient characteristics of the data. The theory differs from the one currently favored in the literature in that the conventional concepts of free carrier lifetime and traps are avoided. Instead, a rigorous solution to equations describing the free-electron recombination rate was derived. Several observations, based upon the evolved concepts, were made and correlated to the measured data. The most surprising of these is the implication that the hole concentration does not reach equilibrium when light is removed, for perhaps as long as a year. (Author)

AD-261 115 Div. 25
(11 Aug 61) OTS price $7.60

Westinghouse Electric Corp., Pittsburgh, Pa.
RESEARCH AND DEVELOPMENT OF DENDRITIC CRYSTAL GROWTH PROCESS.
Rept. on Airborne Molecular Electronics.
Mar 60, 76p. incl. illus. table.
(Contract AF 33(616)6086)
(WADD TR 60-8)
Unclassified report

DESCRIPTORS: Semiconductors, *Crystals, Growth, Single crystals, Silicon, Quartz crystals, Germanium, Preparation, Cooling, Boron compounds, Nitrides, Temperature, Crystal ovens, Crystal structure.

It was demonstrated that silicon dendrites can be grown which have properties similar to germanium dendrites. It was further found that the anticipated difficulties in the dendritic growth of silicon did indeed exist, and furthermore that their solution was more difficult than expected. Three separate techniques for growing dendrites were investigated, all of which involve creating special thermal geometries in which a supercooled liquid region is supported by a region of liquid at or above the melting point. The first involves melting a pool in a silicon disk; the second the melting of a drop on the end of a silicon rod; and the third utilizes a fuzed quartz crucible with thermal shielding. All these methods seem promising, however, only the latter two were experimentally successful. Simple experimental devices were fabricated from silicon dendrites. The spread in the characteristics of these devices indicates that considerable variation exists in present dendritic material, however the fact that some of the devices had very good characteristics indicates that dendritic silicon is not inherently unsuitable for device fabrication. (Author)

AD-261 137 Div. 25
(14 Aug 61) OTS price $1.60

Aerospace Corp., Los Angeles, Calif.
DISCONTINUITY STRESSES IN PRESSURE VESSELS--SHORT CIRCULAR CYLINDRICAL SHELL WITH ELLIPSOIDAL HEAD CLOSURE. PART I. SHELLS OF EQUAL THICKNESS,
by Norman N. Au. 5 July 61, 12p. incl. illus.
(Rept. no. TDR-594(1108)TN-1)
(Contract AF 04(647)594)
Unclassified report

DESCRIPTORS: *Pressure vessels, Ellipsoids Cylindrical bodies, Structural shells, Shear stresses, *Stresses, Thickness, Elastic shells.

Elastic stress distributions at the junction of a pressure vessel which consists o a short circular cylindrical shell section wi a ellipsoidal head closures are developed on the basis of Love's classical shell theory. This brief study is facilitated by assuming uniform shell thickness throughout the pressure vessel. A typical example was carried out, and the results were compared to those obtained by using the formulas of Timoshenko, S. and Woinowsky-Krieger, S. (Theory of Plates and Shells, McGraw-Hill, Inc., NYC, 2 ed, 1959). (Author)

AD-261 155 Div. 25
(14 Aug 61) OTS price $7.60

Copenhagen U. (Denmark).
THEORY OF IRREVERSIBLE PROCESSES. I. PARAMETERS OF SMALLNESS,

by Joseph Higgins. 1 May 61, 70p. 11 refs. (Technical note no. 5)
(Contract AF 61(052)133)
(ARL-111) Unclassified report

DESCRIPTORS: *Irreversible processes, Particles, Molecules, Gases, Theory, Mathematical analysis, Motion, Reaction kinetics, Mechanics.

The theory of irreversible processes proposed by Prigogine and Van Hove is reviewed and the master equation is rederived directly in the phase space without reference to the Fourier space. The assumptions involved are closely examined with particular emphasis on the justification of the master equation as derived from the Liouville equation. It is demonstrated that the conditions of a parameter of smallness (lambda) associated with the interaction potential energy and large time (t) compared to a collision time are neither necessary or sufficient to justify the derivation of the master equation. A necessary, but physically restrictive, condition, is obtained, and the usefulness of the master equation is discussed. (Author)

AD-261 171 Div. 25
(14 Aug 61) OTS price $2.60

Honeywell Research Center, Hopkins, Minn.
KINKING AND THE FRACTURE OF IONIC SOLIDS,
by R. J. Stokes, T. L. Johnston, and C. H. Li.
June 61, 20p. incl. illus. 15 refs. (Rept. no. HR-61-127; Technical rept. no. 12)
(Contract Nonr-245600, Proj. NR-032-451)
Unclassified report

DESCRIPTORS: *Single crystals, Metallic crystals, Crystal structure, Crystals, Sodium compounds, Chlorides, Lithium compounds, Fluorides, Magnesium compounds, Oxides, *Fracture (Mechanics), Mechanical properties, Deformation, Stresses, Temperature, High temperature research, Low temperature research.

A single crystal undergoing plastic bending develops constraints due to the gradient in lateral contraction across the beam. These constraints result in lateral stresses which may be relieved by the process of anticlastic kinking. Temperature affects the structure of kink boundaries and their subsequent role in initiating fracture. At high temperatures the resultant dislocations are ineffective barriers to slip and the crystals are ductile. At low temperatures the resultant dislocations provide strong barriers to slip and cracks nucleate at the kink boundary. At very low temperatures fracture occurs before the second set of glide dislocations have been activated to generate anticlastic kinks. Relaxation of the lateral stress results in a complex fracture. Compatible observations of the change in fracture behavior under bending over different temperature ranges have been made on a number of ionic solids. (Author)

AD-261 172 Div. 25, 17
(14 Aug 61) OTS price $2.60

Honeywell Research Center, Hopkins, Minn.
CRACK NUCLEATION IN MAGNESIUM OXIDE BIcystals under compression,
by T. L. Johnston, R. J. Stokes, and C. H. Li.
July 61, 26p. incl. illus. table (Technical rept. no. 13)
(Contract Nonr-245600, Proj. NR-032-451)
Unclassified report

DESCRIPTORS: *Magnesium compounds, Oxides, Crystal structure, *Crystals, Single crystals, Deformation, *Fracture (Mechanics), Mechanical properties, Stresses, Shear stresses, Lattices.

MgO bi-crystals having a wide range of misorientation were tested under 3 point bending. The interaction of slip bands coming from the center loading beam with the grain boundary were studied in the case of small misorientations, medium misorientations and large misorientation. The work showed that a crack can nucleate at a grain boundary in MgO at room temperature by the pile-up of a single band of edge dislocations according to the classical Zener model. (Author)

AD-261 205 Div. 25
(14 Aug 61) OTS price $2.60

Frick Chemical Lab., Princeton U., N. J.
A STUDY OF THREE MODELS FOR THE INTERPRETATION OF INTENSITIES OF VIBRATIONAL BANDS OF DIATOMIC MOLECULES,
by David Garvin. 1961, 23p. incl. illus. tables, 18 refs.
(Contract AF 18(603)134)
Unclassified report

DESCRIPTORS: *Molecules, *Molecular spectroscopy, *Molecular structure, *Dipole moments, Hydrogen compounds, Chlorides, Fluorides, Theory, Perturbation theory, Vibration, Intensity, Molecular rotation.

Transition probabilities for the rotating Morse Oscillator have been calculated for dipole functions expressed as power series and as analytical expressions having the expected behavior with internuclear distance, using previously developed methods. Comparison with experimental data suggests that mu prime (reduced mass) for HF is increasing, but that the mu prime (reduced mass) for HCl is decreasing at the equilibrium internuclear distance. The general treatment used for the rotational perturbation of the vibrational transition probability is shown to reproduce the experimental data poorly. It is suggested that a recent approximation of this theory is unsatisfactory. (Author)

AD-261 207 Div. 25
(14 Aug 61) OTS price $1.60

Pennsylvania State U. Coll. of Mineral Industries, University Park.
CRYSTAL CHEMISTRY STUDIES.
Quarterly progress rept. no. 6, 1 Apr-30 June 61,
by Rustum Roy, R. Datta, and D. Grisafe.
20 July 61, 13p. incl. illus. table.
(Contract DA 36-039-sc-85311)
Unclassified report

DESCRIPTORS: *Spinels, *Ferroelectric materials, *Piezoelectric crystals, *Ferroelectric crystals, *Ferromagnetic materials, Dielectric properties, Single crystals, Ions, Diffusion, Crystal structures, Crystals, Lattices, Temperature, X-ray diffraction analysis, Quartz crystals, Garnet, Nickel compounds, Germanium compounds, Yttrium compounds, Calcium compounds, Fluorides, Solid state physics, Electrical properties, Aluminum compounds.

The experimental phase of the dielectric constant and loss measurements in the strongly defective fluorite and spinel solid solutions is complete; interpretation of the voluminous data is still in process. Experimental work on the temperature dependence of the cation distribution in the spinels is also nearly complete and the entire results are being written up as a dissertation. New work is being initiated on a crystal chemical approach to the synthesis of new host structures for ferrimagnetism. (Author)

AD-261 213 Div. 25, 2
(17 Aug 61) OTS price $1.10

Laboratory of Astrophysics and Physical Meteorology, Johns Hopkins U., Baltimore, Md.
SKY RADIATIONS FROM THE BALLOON FLIGHT OF MARCH 8, 1960,
by R. W. White and J. Strong. 1 Feb 61, 3p. illus. (Scientific rept. no. 1)
(Contract AF 19(604)6174)
(AFCRL-450) Unclassified report

DESCRIPTORS: *Atmosphere, *Infrared radiation, Infrared spectroscopy, *Balloons, Recording devices, Intensity, Flight paths, Temperature.

The results of zenith-nadir radiations taken during the balloon flight of March 8, 1960 are reported. The balloon failed at 54,500 feet and rose more rapidly than desired, but the results are nevertheless useful. They are reported as five bands, as a function of altitude. (Author)

AD-261 220 Div. 25
(14 Aug 61) OTS price $4.60

Uppsala U. (Sweden).
NUCLEAR STATE WAVE FUNCTIONS GENERATED BY PROJECTION OPERATORS,
by Jean-Louis Calais. 1 Oct 60, 45p. incl. illus. tables (Technical note no. 52)
(Contract AF 61(052)351)
(ARL-104) Unclassified report

DESCRIPTORS: *Quantum mechanics, *Nuclear states, *Nuclear shell models, Nuclear spins, Functions, Atomic orbitals, Atomic structure, Mathematical analysis, Electron transitions, Excitation, Atomic spectrum, Electrons, Theory, Solid state physics.

The complete set of orthogonal states used in nuclear shell-model calculations is generally obtained by group-theoretical methods. It is shown how the projection operator technique provides an alternative method. The advantages and disadvantages of the two methods are discussed, and it is pointed out that the projection operator method combines with the antisymmetry requirement in a more natural way than the vector-coupling method. Finally, illustrative calculations are carried out for the nuclear configuration p superscript 3. (Author)

AD-261 221 Div. 25
(14 Aug 61) OTS price $2.60

Uppsala U. (Sweden).
STUDIES ON THE ALTERNANT MOLECULAR ORBITAL METHOD. I. GENERAL ENERGY EXPRESSION FOR AN ALTERNANT SYSTEM WITH CLOSED SHELL STRUCTURE,
by R. Pauncz, J. de Heer, and P. O. Lowdin.
1 Nov 60, 27p. incl. illus. table (Technical note no. 55)
(Contract AF 61(052)351)
(ARL-105) Unclassified report

DESCRIPTORS: *Quantum mechanics, Nuclear states, Nuclear spins, *Atomic orbitals, Atomic structure, Molecules, Electrons, Excitation, Chemical bonds, Atomic energy levels, *Nuclear shell models, Functions, Mathematical analysis, Atomic spectrum, Atoms, Electron transitions, Theory, Solid state physics.

The alternant molecular orbital method is used to derive a general energy expression for an arbitrary alternant system with closed shell structure. This expression exhibits a simple dependence on a single mixing parameter, minimization with respect to which yields the optimum energy. An analysis reveals the effectiveness of the method to depend on the relative magnitude of two quantities, one involving the one-electron operator energies and the other related to electron interaction integrals which connect the bonding with the anti-bonding orbitals from the simple ASMO (alternate system molecular orbital) scheme. Some comments on the method, in the light of the results obtained, are added. (Author)

AD-261 222 Div. 25
(14 Aug 61) OTS price $2.60

Uppsala U. (Sweden).
STUDIES ON THE ALTERNANT MOLECULAR ORBITAL METHOD. II. APPLICATION TO CYCLIC SYSTEMS,
by R. Pauncz, J. de Heer, and P. O. Lowdin.
1 Nov 60, 21p. incl. tables (Technical note no. 56)
(Contract AF 61(052)351)
(ARL-106) Unclassified report

DESCRIPTORS: *Quantum mechanics, *Atomic energy levels, Nuclear shell models, Atomic spectrum, Functions, *Atomic orbitals, Molecules, Electrons, Atoms, Chemical bonds, Carbon, Hydrogen, Electron transitions, Benzenes, Mathematical analysis, Solid state physics, Theory.

A cyclic pi-electron system is treated by the alternant molecular-orbital method using different orbitals for different spins. The energy depression per electron is studied and approaches 0.4 ev for large systems. (Author)

AD-261 224 Div. 25
(14 Aug 61) OTS price $2.60

Uppsala U. (Sweden).
PERTURBATION THEORY FOR THE FOCK-DIRAC DENSITY MATRIX,
by Roy McWeeny. 15 Mar 61, 19p. (Technical note no. 61)
(Contract AF 61(052)351)
(ARL-109) Unclassified report

DESCRIPTORS: *Quantum mechanics, *Atomic orbitals, *Atomic energy levels, Electrons, Excitation, Atomic spectrum, Nuclear spins, Functions, Perturbation theory, Mathematical analysis, Theory, Solid state physics.

A direct method is given for obtaining, to any order, the effect of a perturbation upon the Fock-Dirac density matrix of an N-electron system. (Author)

AD-261 225 Div. 25, 4
(14 Aug 61) OTS price $2.60

Uppsala U. (Sweden).
ON THE NON-ORTHOGONALITY PROBLEM FOR INTERACTING ELECTRONIC SYSTEMS,
by Roy McWeeny. 15 Jan 61, 18p. incl. illus.
(Technical note no. 59)
(Contract AF 61(052)351)
(ARL-108) Unclassified report

DESCRIPTORS: *Quantum mechanics, Matrix calculus, Crystals, Fluids, Chemistry, Sweden, Atoms, Molecules, Helium, Helium bombardment, Physical chemistry.

An electronic system may often be regarded as composed of two interacting subsystems. It is then possible to discuss the properties of the whole in terms of those of its parts, density matrix theory providing a convenient mathematical tool for this purpose. Earlier discussions, in which the wave functions of the subsystems were restricted so as to satisfy a strong orthogonality condition (and which consequently could not be assumed exact), are generalized to allow for non-orthogonality. As a simple illustration, the approach has been tested on the system of two helium atoms. This calculation, which is of a preliminary nature, serves to indicate the great importance of non-orthogonality corrections: these become exceedingly large as the subsystems begin to interpenetrate, and describe strong repulsions. It is hoped that this method of attack will prove of value in discussing the repulsive potentials between atoms and molecules in crystals and fluids. (Author)

AD-261 240 Div. 25
(25 Aug 61) OTS price $2.60

Ecole Normale Superieure (France).
OPTICAL TRANSITIONS NEAR THE ABSORPTION EDGE IN CdS. I. - BAND STRUCTURE IN CdS,
by M. Balkanski and J. des Cloizeaux. Aug 61, 25p. incl. illus. tables (Technical note no. 1)
(Contract AF 61(052)130)
(ARL-81) Unclassified report

DESCRIPTORS: *Optics, *Cadmium compounds, *Sulfides, *Brillouin zones, Absorption, Solid state physics, Electron transitions, Crystals, Lattices, Light.

AD-261 242 Div. 25
(15 Aug 61) OTS price $1.60

Brown U. Div. of Applied Mathematics, Providence, R. I.
ON THE COMPLETENESS OF CERTAIN STRESS FUNCTIONS IN THE LINEAR THEORY OF ELASTICITY,
by Eli Sternberg and M. E. Gurtin. July 61, 16p. 17 refs. (Technical rept. no. 12)
(Contract Nonr-562(25, Proj. NR-064-431)
Unclassified report

DESCRIPTORS: *Stresses, Mathematical analysis, *Elasticity, Vector analysis, Linear systems, Motion, Equations, Functions, Vector analysis, Matrix algebra, Operators (Mathematics), Shear stresses, Differential equations, Solids, Theory.

The completeness of certain solutions in terms of stress functions to the displacement equations of motion and equilibrium in classical elasticity theory is treated. Specifically, we deal with the stress functions of Lame and of Somigliana in elastodynamics, as well as with those of Galerkin and Papkovich in the equilibrium theory. The four sets of stress functions cited are apt to be the most significant from the viewpoint of applications and the present method for establishing their completeness appears to be especially economical. (Author)

AD-261 254 Div. 25, 8
(15 Aug 61) OTS price $1.60

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
THEORETICAL TREATMENT OF THE TRANSMISSION OF A COATED MULTIELEMENT LENS SYSTEMS,
by Matthew Nowak. Aug 61, 13p. incl. illus. (Technical rept. no. FRL TR 43)
(Proj. 512-15-029)
Unclassified report

DESCRIPTORS: *Lenses, *Wave transmission, *Infrared radiation, Coatings, Reflection, Intensity, Magnetic effects, *Dielectric films, Propagation, Refractive index, Mathematical analysis, Differential equations, Optical glass, Tables.

Starting with Maxwell's equations, a general expression was derived for the spectral transmission of a multielement lens system coated for low reflection. The expression was then used to calculate spectral transmission at two different transmission maxima, .55 and .65 micron, for three different types of glass having indexes of refraction of 1.5, 1.6, and 1.7. For the antireflection dielectric layer, an index of refraction of 1.38, equivalent to that of MgF2, was used. The calculated values, presented in both tabular and graph form, cover the visible range through .9 micron. (Author)

AD-261 267 Div. 25
(15 Aug 61) OTS price $5.60

RIAS, Inc., Baltimore, Md.
SOME EFFECTS OF ADSORBED POLAR MOLECULES ON THE BEHAVIOR OF LITHIUM FLUORIDE CRYSTALS.
Summary status rept.,
by A. R. C. Westwood. May 61, 62p. incl. illus. tables.
(Contract DA 36-034-505-ORD-3349)
(WAL TR 832/1-2) Unclassified report

DESCRIPTORS: *Lithium compounds, *Fluorides, Surfaces, Surface properties, Adsorption, Crystals, Crystal structure, Lattices, Mechanical properties, Fracture (Mechanics), Stresses, Shear stresses, Fatty acids, Iron compounds, Chlorides, Stearic acids, Photoengraving, Chemical impurities.

Metallographic studies have demonstrated that aqueous solutions of long chain fatty and perfluoro-acids can serve as etchants for LiF crystals revealing the points of emergence of dislocations and other surface features of interest. Polar molecules might be expected to hinder the operation of the half-loop surface-sources present in as-cleaved crystals-adsorption-locking. An extimate of the possible magnitude of such locking was made and confirmed by studies on the yielding behavior of LiF crystals. Compression and bending experiments revealed that adsorbed polar molecules cause an increase in yield and critical resolved shear stresses before inducing the relatively lower rate of work-hardening commonly observed with other materials, known as the Rebinder effect. Possible explanations for the etching and mechanical behavior are presented. (Author)

AD-261 272 Div. 25, 20
(24 Aug 61) OTS price $3.60

Midwest Research Inst., Kansas City, Mo.
DEVELOPMENT OF SYSTEMS FOR AUTOMATIC, REVERSIBLE

CONTROL OF INTENSITY OF VISIBLE RADIATION THROUGH TRANSPARENT MATERIALS.
Final rept. 1 Jan-30 June 61,
by Florence I. Metz. 26 July 61, 29p. incl. illus. tables.
(Contract NOw 61-0587-d)
Unclassified report

DESCRIPTORS: *Optical filters, *Optical materials, *Thin films, *Semiconducting films, Absorption, Reflection, Light, Light transmission, Shielding, Dyes, Metal films, Electric fields, Atomic bomb explosions, Nuclear explosions, Optical coatings, Organic coatings, Materials.

Composite films containing zinc, oxide, gold, resorcinol and a photochromic sydnone showed promise in the preparation of a glazing material with variable transmission properties. Such multilayer films exhibited desirable absorption and reflection properties in the ultraviolet, visible, and infrared portions of the spectrum. A study of the photochromic behavior of N-3-pyridylsydnone, N3PS, has indicated that a cerium oxide filter might be helpful in reducing the fatigue which is apparent after repeated excitation-recovery cycling. Since the fatigue behavior of the photochromic sydnone makes the material unsatisfactory for the visible absorber in an optical filter, several other materials and related techniques were examined. These materials are the so-called electrochromic dyes. The phenomenon of electrochromism has not been unequivocally established in the solid state. The spectral shifts which have been observed in solution may be the result of the orientation of the molecules by the applied field. (Author)

AD-261 333 Div. 25, 17
(17 Aug 61) OTS price $2.60

Rome U. (Italy).
STUDY ON THE BEHAVIOUR OF DEFECT METALLIC SURFACES OF SINGLE-CRYSTALS IN OXIDATION EXPERIMENTS UNDER CONTROLLED ATMOOSPHERE.
Final technical rept. 1 Apr-30 June 61.
30 June 61, 15p. incl. illus.
(Contract DA 91-591-EUC-1775)
Unclassified report

DESCRIPTORS: Bismuth, *Single crystals, Surfaces, *Metallic crystals, Surface properties, Lattices, Deformation, *Oxidation, Ozone, X-rays, Controlled atmospheres, Plasticity, Zinc coatings, Vapors, Condensation, Chemical reactions, Purification, Zone melting, Oxygen, Hydrogen, Oxides, Nucleation, Reduction.

An investigation was made of the chemical behaviour of cleavage surfaces of Bi single-crystals, and includes: (1) the conditions that are more apt to reveal, by a controlled oxidation, the distribution of point defects on surfaces of Bi single-crystals; (2) the effects, that oxidation, performed under X-rays exposure or with O containing a small amount of O3 may have on the decoration process; (3) the effects of a localized plastic deformation on the distribution and intensity of the oxidation patterns; (4) the decoration effects on cleavage surfaces of Bi single crystals by condensation of pure Zn; (5) the decoration effects superimposed on previously oxidized surface; and (6) the preliminary studies on a controlled reduction process based on the use of oxide single-crystals. (Author)

AD-261 335 Div. 25, 14, 17
(16 Aug 61) OTS price $1.10

Cincinnati U., Ohio.
THERMODYNAMIC INVESTIGATION OF CERAMIC MATERIALS AT ELEVATED TEMPERATURES.
Quarterly rept. 15 Mar-15 June 61,
by Michael Hoch. 1 Aug 61, 7p. incl. table.
(Contract AF 33(616)6299)
Unclassified report

DESCRIPTORS: *Ceramic materials, Phase studies, *Thermodynamics, *Refractory materials, Lattices, Deformation, Thermochemistry, Electrolytic cells, Electric potential, Chemical reactions, Iron compounds, Zirconium compounds, Chromium compounds, Oxides, Electrolytes, Calcium compounds, Chromium, Chromium alloys, Nickel alloys, X-ray diffraction analysis, High temperature research.

Electromotive force studies of FeO were continued to determine the behavior of their vacancies. The partial free energy of O in FeO was determined from measurements of electromotive force in a cell consisting of Fe3O4/FeO//0.8ZrO2 + 0.2CaO//FeO/Fe; EMF vs temperature measurements were made from 1195 to 1455 K. High temperature X-ray diffraction was used to determine the structure and transition temperature of Cr and Cr-Ni alloys. No face-centered cubic Cr was observed in the diffraction patterns taken at 1300 C on 70 Cr-30 Ni alloy.

AD-261 336 Div. 25, 17
(17 Aug 61) OTS price $2.25

Defense Metals Information Center, Columbus, Ohio.
THE EMITTANCE OF IRON, NICKEL, AND COBALT AND THEIR ALLOYS,
by W. D. Wood, H. W. Deem, and C. F. Lucks.
25 July 61, 82p. incl. illus. tables, 18 refs.
(DMIC memo. no. 119)
Unclassified report

DESCRIPTORS: *Thermal radiation, Iron, Nickel, Cobalt, Iron alloys, Nickel alloys, Cobalt alloys, Metals, Alloys, Heat transfer, Reflection, Spectrographic analysis, Spectrographic data.

A compilation is presented of original test data on emittance and reflectance of iron, nickel, and cobalt and their alloys. The data were taken from the literature published during the period 1940-1959 inclusive, and as much of the 1960 literature as could be obtained. The following sources were searched: Chemical Abstracts, Ceramic Abstracts, Metallurgical Abstracts, Nuclear Science Abstracts, and the files of the Defense Metals Information Center (DMIC). Attempts were made to evaluate these sources of data according to the apparent thoroughness of methods and techniques as described by the various investigators. In many cases the descriptions in the literature are a summary of methods and results, and a complete evaluation is impossible. The data are separated according to material and to the type of measurement, whether spectral or total. (Author)

AD-261 341 Div. 25
(16 Aug 61) OTS price $1.60

David Taylor Model Basin, Washington, D. C.
RESONANT FREQUENCIES OF PULSATING AIR BUBBLES GENERATED IN SHORT, OPEN-ENDED PIPES,

by Charles Devin, Jr. July 61, 9p. incl. illus. 13 refs. (Rept. no. 1522)

Unclassified report

Presented at the fifty-fifth meeting of the Acoustical Society of America, Washington, D. C., 10 May 1958.

DESCRIPTORS: *Bubbles, Frequency, *Acoustics, *Underwater sound, Damping, Volume, Equations of state, Mathematical analysis, Pressure, Motion, Measurement, Equations, Test methods, Pipes.

The natural frequency of volume pulsations of an air bubble at the center of a short, open-ended, rigid tube should be lower than that of a bubble of equal size in a free field. The discussion is limited to the case where the amplitude of the volume pulsations are assumed to be sufficiently small that the pulsations may be described by linear equations. Air bubbles were generated at nozzles submerged in water in a free field and, alternately, surrounded by short sections of brass tubing. The frequency of oscillations was determined through measurement of the radiated sound pressure. The effect of the tube on the resonant frequency agreed with that computed from Levine's solution for the potential of a point source in an infinitely long cylinder containing an incompressible liquid. (Author)

AD-261 343 Div. 25, 4
(17 Aug 61) OTS price $1.10

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
EPR OBSERVATION OF $NH_3(+)$ FORMED BY X-RAY IRRADIATION OF AMMONIUM PERCHLORATE CRYSTALS,
by James S. Hyde and Eli S. Freeman. Aug 61, 10p. incl. illus. (Technical rept. no. FRL TR 38; In cooperation with Varian Associates, Palo Alto, Calif.)

Unclassified report

DESCRIPTORS: *Ammonium radicals, *Perchlorates, *Ammonia, *Free radicals, Crystal structure, Crystals, *Paramagnetic crystals, Paramagnetic resonance, Radiation damage, Spectrographic analysis, Hyperfine structure, Ions, Stability, Preparation, Temperature, Decomposition, X-rays.

An investigation of irradiated ammonium perchlorates was conducted by electron spin resonance. A new specie, the $NH_3(+)$ radical was discovered. This ion radical appears to be stable up to at least 125 C. (Author)

AD-261 344 Div. 25, 8, 30
(17 Aug 61) OTS price $1.10

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
FILM STRAIN GAUGES FOR MEASURING FERRITE MAGNETOSTRICTION,
by V. A. Yugov and G. P. D'Yakov. July 61, 5p. (Technical notes no. FRL TN 80; Trans. from Izmeritel'naya technika no. 10, pp. 31-32, 1960)

Unclassified report

DESCRIPTORS: *Strain gages, Measurement, *Ferrites, *Ferromagnetic materials, *Magnetostriction, Test methods, Magnetic properties, Delay lines, Design, Films, Sensitivity, Thin films, Alloys, Technological intelligence, USSR, Temperature.

Film strain gauges operate stably even in the presence of comparatively large temperature fluctuations. Thanks to the fact that the sensitive film is deposited directly on the surface of the ferrite (without adhesive or base), the errors ordinarily observed when adhesive strain gauges are heated play no part. Since films of nichrome and platinum-iridium and other alloys recently introduced are highly stable up to 300-400 C, it has become possible to investigate magnetostriction in ferrites as a function of the temperature. (Author)

AD-261 359 Div. 25
(17 Aug 61) OTS price $1.60

Institute of Science and Tech., U. of Michigan, Ann Arbor.
SOME MEASUREMENTS OF THE ABSORPTION COEFFICIENT OF SOIL USING THE IMPEDANCE TUBE TECHNIQUE.
Rept. on Proj. Michigan,
by James H. Prout. Aug 61, 7p. incl. illus. tables (Rept. no. 2900-257-S)
(Contract DA 36-039-sc-78801)

Unclassified report

A speech delivered to Acoustical Society of America Meeting 10-13 May 1961.

DESCRIPTORS: *Soils, *Sound, Propagation, Absorption, Measurement, Impedance matching, Tests.

In any field testing involving horizontal propagation of sound, it is desirable to know how much is absorbed by the ground. Since the sound-absorption properties of the ground are affected by many factors, it is usually necessary to make an estimate of this effect. This paper describes an experiment to measure absorption coefficient of the soil by means of an impedance tube. Controlled laboratory tests are described which measured the effect of moisture content and particle size on the absorption coefficient. Effects of grass on absorption coefficient are also noted. (Author)

AD-261 363 Div. 25
(17 Aug 61) OTS price $8.60

Massachusetts Inst. of Tech., Cambridge.
SOLID-STATE AND MOLECULAR THEORY GROUP.
Quarterly progress rept. no. 41.
15 July 61, 94p. incl. illus. tables.
(Contract Nonr-184134)

Unclassified report

DESCRIPTORS: *Solid state physics, Molecular structure, *Molecules, *Brillouin zones, Water, Crystals, Lattices, *Electronics, Benzenes, Copper, Methanes, Documentation.

Contents:
Concerning the Fermi surface of copper, G. A. Burdick
Analytic Hartree-Fock wave functions for the 3p shell atoms, R. E. Watson and A. J. Freeman
The origin of effective fields in magnetic materials, A. J. Freeman and R. E. Watson
A configuration interaction study of the electronic states of the water molecule, D. P. Merrifield

A study of the ground state of the methane molecule in the valence bond approximation,
B. J. Woznick
Benzene, J. W. Moskowitz
The construction of certain coefficients used in the evaluation of molecular integrals,
G. Bessis
On the optical absorption of K3(Cr(CN)5NO)H2O,
C. S. Naiman
Energy band program, F. W. Quelle
Computer controlled printing devices,
K. L. Kelley and M. P. Barnett

AD-261 374 Div. 25, 8
(17 Aug 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
THE NEUTRALIZATION OF ION-ROCKET BEAMS,
by Harold R. Kaufman. Aug 61, 33p. incl. illus. tables (Technical note no. D-1055)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA technical note D-1055.

DESCRIPTORS: Neutralization, Plasma physics, *Ion beams, *Ion rockets, Secondary emission, *Ions, *Electrons, Kinetic theory, Propulsion.

The experimental ion-beam behavior obtained without neutralizers is compared with both simple collision theory and plasma-wave theory. This comparison indicates that plasma waves play an important part in beam behavior, although the present state of plasma-wave theory does not permit more than a qualitative comparison. The theories of immersed-emitter and electron-trap neutralizer operation are discussed; and, to the extent permitted by experimental data, the theory is compared with experimental results. Experimental data are lacking completely at the present time for operation in space. The results that might be expected in space and the means of simulating such operation in Earth-bound facilities, however, are discussed. (Author)

AD-261 376 Div. 25, 17
(16 Aug 61) OTS price $7.60

Northwestern Technological Inst., Evanston, Ill.
BIBLIOGRAPHY ON HIGH SPEED DEFORMATION OF MATERIALS (1950-1961),
by J. R. Cotner and J. Weertman. 15 May 61, 77p. 273 refs.
(Contract AF 29(601)4343)
Unclassified report

DESCRIPTORS: *Deformation, *Bibliography, Materials, Metals, Alloys, Plasticity, Single crystals, *Explosive forming, Impact shock, Hypervelocity projectiles, Cratering, Stresses.

Abstracts of the literature, from 1950 to 1961, dealing with high speed deformation of materials are given in this bibliography. References concerning stress wave propagation are included to aid in the understanding of the deformation. The arrangement of the abstracts is chronological with an alphabetic sequence within each year. An author index is included. The principal reference works used are: American Society of Metals Review of Metal Literature; Applied Mechanics Reviews; Physics Reviews; Journal of Applied Physics; Journal of Applied Mechanics; American Society for Testing Materials, Proceedings; Transactions of the American Society for Metals; Proceedings of the Society for Experimental Stress Analysis; Transactions of the American Institute of Mining and Metallurgical Engineers, The Metallurgical Society; Proceedings of The Conference on The Properties of Materials at High Rates of Strain; Proceedings of Third Symposium on Hypervelocity Impact; Plasticity, Proceedings of the Second Symposium on Naval Structural Mechanics; and Response of Metals to High Velocity Deformation. (Author)

AD-261 377 Div. 25, 17
(16 Aug 61) OTS price $1.60

Northwestern Technological Inst., Evanston, Ill.
FAST MOVING EDGE DISLOCATIONS ON THE (111) PLANE IN ANISOTROPIC FACE-CENTERED-CUBIC CRYSTALS,
by J. Weertman. July 61, 19p. incl. table (Status rept. no. 3)
(Contract AF 29(601)4343)
Unclassified report

DESCRIPTORS: *Metallic crystals, *Solid state physics, Shear stresses, Lattices, Iron, Metallurgy, Fracture (Mechanics), Elasticity, Partial differential equations, *Crystals, Crystal structure, *Wave transmission, *Stresses, Mathematical analysis.

The elastic displacement field around a uniformly moving edge dislocation has been obtained for the case where the dislocation glides on a (111) plane in a 110 direction in an anisotropic face-centered-cubic crystal. An equation is obtained for the velocity (the Rayleigh wave velocity) at which the shear stress on the slip plane of a moving dislocation is zero. Dislocations of like sign moving at velocities faster than this velocity attract rather than repel each other. It is concluded that when anisotropy is small and the elastic constant c11 is smaller than c12+2c44 (the more commonly occurring relationship between the elastic constants) the Rayleigh wave velocity is increased above its value in an isotropic crystal and therefore the extent of the velocity region where dislocations exhibit an anomalous behavior is decreased. For slightly anisotropic crystals the limiting velocity of dislocation motion is the slower of the two shear velocities in the 110 direction. (Author)

AD-261 378 Div. 25, 17
(16 Aug 61) OTS price $1.60

Northwestern Technological Inst., Evanston, Ill.
FAST MOVING EDGE DISLOCATIONS IN ALPHA IRON,
by J. Cotner and J. Weertman. 7 June 61, 13p. incl illus. tables (Status rept. no. 2)
(Contract AF 29(601)4343)
Unclassified report

DESCRIPTORS: *Metallic crystals, *Solid state physics, Shear stresses, Lattices, Iron, Metallurgy, Fracture (Mechanics), Elasticity, Crystals, Crystal structure, Wave transmission, Stresses, Mathematical analysis.

A calculation is made of the shear stress on the slip plane of an edge dislocation moving uniformly in the alpha iron lattices. The dislocation is taken to be on a (110) plane and moving in a 111 direction. It is found that the shear stress approaches zero at the Rayleigh wave velocity, 0.92c, where c is the shear velocity in the 111 direction. The limiting velocity of dislocation motion is 0.94c. In the velocity range between 0.92c and 0.94c dislocations of like sign attract one another. The extent of this velocity region in which dislocations exhibit anomalous behavior is three times smaller

than the corresponding region in isotropic crystals. Hence, as compared with the isotropic case, it is more difficult to bring dislocations moving in iron on a (110) plane into a velocity region where coalescence of fast moving dislocations can occur. (It should be noted that this coalescence may lead to fracture.) (Author)

AD-261 379 Div. 25, 17
(16 Aug 61) OTS price $2.60

Northwestern Technological Inst., Evanston, Ill.
FAST MOVING EDGE DISLOCATIONS ON THE (110) PLANE IN ANISOTROPIC BODY-CENTERED-CUBIC CRYSTALS,
by J. Weertman. 1 June 61, 27p. incl. tables. (Status rept. no. 1)
(Contract AF 29(601)4343)
Unclassified report

DESCRIPTORS: *Metallic crystals, *Solid state physics, Shear stresses, Lattices, Metallurgy, Fracture (Mechanics). Elasticity, *Crystals, *Crystal structure, Iron, Molybdenum, Tungsten, Sodium, Potassium, Brass, *Wave transmission, *Stresses, Mathematical analysis, Partial differential equations.

The elastic displacement field around a uniformly moving edge dislocation has been obtained for the case where the dislocation glides on a (110) plane in a 111 direction in an anisotropic body-centered-cubic crystal. A general solution is found which involves elastic displacements in all three coordinate directions. The situation where the degree of anisotropy is small is analysed in detail. An equation is obtained for the velocity (the Rayleigh wave velocity) at which the shear stress on the slip plane of a moving dislocation is zero. Dislocations of like sign moving at velocities faster than this velocity attract rather than repel each other. It is concluded that when anisotropy is small and the elastic constant c11 is smaller than c12+2c44 (the more commonly occurring relationship between the elastic constants) the Rayleigh wave velocity is increased above its value in an isotropic crystal and therefore the extent of the velocity region where dislocations exhibit an anomalous behavior is decreased. (Author)

AD-261 382 Div. 25, 4
(16 Aug 61) OTS price $2.60

Nottingham U. (Gt. Brit.).
PHYSICAL AND CHEMICAL PROPERTIES OF ANHYDROUS NITRATES OF THE TRANSITION METALS.
Annual technical rept. 1 June 60-30 May 61, by C. C. Addison. 30 June 61, 24p. incl. illus. tables, 11 refs.
(Contract DA 91-591-EUC-1450)
Unclassified report

DESCRIPTORS: Transition elements, Metallic compounds, *Nitrates, *Chemical bonds, Metals, Atoms, Physical properties, Chemical properties, Molecular structure, Determination, X-ray photography, *Beryllium compounds, Infrared spectroscopy, X-ray diffraction analysis, Ethylenes, Dioxides, Heterocyclic compounds, Crystal structure.

Various ways in which the nitrate group can bond covalently to a metal atom are discussed. The chemical properties are related to the type of covalent bond involved, and the importance of a crystallographic study of the addition compounds of copper nitrate with nitromethane and dioxan is explained. The preparation and some properties of the new compound basic beryllium nitrate are described. This is believed to be the first compound in which the nitrate group acts as a bridge group between two metal atoms, and its infra-red spectrum is presented. A fairly complete survey of the single crystal diffraction patterns has been carried out by the Weissenberg method for the 1:1 complex between copper nitrate and nitromethane and for basic beryllium nitrate. A preliminary X-ray study of the complex copper nitrate, 1.5 dioxan has also been made. The crystallographic data for these three substances are presented. (Author)

AD-261 387 Div. 25, 15
(29 Aug 61) OTS price $2.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
EIGENWAVES ON A LATTICE OF SMALL SCATTERERS,
by Herbert Kurss, 17 July 61, 21p. (Research Rept. no. PIBMRI-936-61)
(Contract AF 18(600)1505)
(AFOSR-1140)
Unclassified report

DESCRIPTORS: *Quantum mechanics, *Scattering, Operators (Mathematics), Crystals, Electromagnetic waves, *Matrix algebra, *Lattices, Greens functions, Resonance, *Electromagnetic wave reflections, Vector analysis, Complex numbers, Electrons, Differential equations, Dielectrics.

Previously, the quantum mechanical Bloch waves in a cubic crystal were analyzed by a cavity or structure constant approach by J. Korringa, W. Kohn (Physica 13:392, 1947) and N. Rostoker, et al. (Phys. Rev. 94:1111, 1954). In the present report, the above method is reformulated to permit the analysis of electromagnetic Bloch waves in artificial dielectrics as well as electromagnetic surface waves on open periodic structures. The analysis, which is particularly appropriate for small scatterers, proceeds as follows. It is shown that a lossless scatterer embedded in a lossless medium can be characterized by a Hermitian matrix R. The lattice structure is then characterized by a structure constant matrix gamma which, in the eigenwave region, is also Hermitian. A dispersion relation for eigenwaves is then obtained as the condition that the determinant of R-gamma vanishes. (Author)

AD-261 420 Div. 25
(17 Aug 61) OTS price $1.10

Westinghouse, Electric Corp., Pittsburgh, Pa.
TEMPERATURE DEPENDENCE OF RAMAN RELAXATION OF CHROMIUM (+3) IN MAGNESIUM OXIDE,
by J. G. Castle, Jr., D. W. Feldman, and P. G. Klemens. Mar 61, 6p. incl. illus. (Scientific rept. no. 8; Scientific Paper no. 908C901-P1)
(Contract AF 19(604)5589)
(AFCRL-301)
Unclassified report

DESCRIPTORS: Chromium, Magnesium compounds, Oxides, Phonons, Lattices, Scattering, Ions, *Paramagnetic crystals, *Microwave oscillators, Temperature, Magnesium, Relaxation time, Crystals, Paramagnetic resonance.

The spin-lattice relaxation for Cr(+3) in cubic sites in MgO is due to Raman scattering of phonons above 30 K. Values of the relaxation time measured at temperatures from 30 to 100 K are given. The data are explained well by an

enhancement of the Raman scattering (above approximately 50 K) associated with chromium ions having a heavier mass than the magnesium ion they replace. (Author)

26. PRODUCTION AND MANAGEMENT

AD-260 800 Div. 26
(8 Aug 61) OTS price $2.60

Office of the Director of Defense Research and Engineering, Washington, D. C.
MENEX. MAINTENANCE ENGINEERING EXCHANGE BULLETIN (2).
July 61, 23p. 50 refs.
Unclassified report

DESCRIPTORS: *Indexes, *Bibliography, *Maintenance, Reliability, Electronic equipment, Test equipment, Ground support equipment, Electrical equipment, Training, Management engineering.

AD-260 936 Div. 26, 17
(9 Aug 61) OTS price $1.10

Titanium Metals Corp. of America, Toronto, Ohio.
DEVELOPMENT OF FINE DIAMETER, HIGH STRENGTH Ti-13V-11Cr-3Al WIRE.
Monthly progress rept. no. 15, 1 May-30 June 61, by E. Bohanek. 21 July 61, 2p. incl. table.
(Contract NOw 60-0188)
Unclassified report

DESCRIPTORS: *Wire, *Titanium wire, Tensile properties, Pickling, Tests, Mechanical properties, Chromium alloys, Aluminun alloys, Vanadium alloys, Manufacturing methods.

AD-260 972 Div. 26, 17
(10 Aug 61) OTS price $2.60

Propellex Chemical Div., Chromalloy Corp., Edwardsville, Ill.
A STUDY OF EXPLOSIVE FORMING SELECTED REFRACTORY METALS.
Progress rept. no. 1, for period ending 30 June 61.
15 July 61, 21p. incl. illus. tables.
(Contract NOw 61-0832-c)
Unclassified report

DESCRIPTORS: *Refractory materials, Molybdenum alloys, Titanium alloys, Tungsten, Niobium alloys, Sheets, *Explosive forming, Dies, Explosives, Deformation.

An investigation was initiated to optimize the strain rate conditions and transmission media for explosive forming of the refractory metals (1) Mo-1/2%Ti, (2) W, (3) Nb alloy Cb-74, and (4) Nb alloy CT-2WZ. Each material will be in the form of 6-x6-x0.040-in. sheets. Fifteen tests are planned for each of the 3 basic materials in a unidirectional-type trough die and 5 tests of each material in a multidirectional cup die. Both dies will be modified to accept springs for the draw-ring assembly and an attempt will be made to evaluate the effect of draw-ring pressure on the elongation and flow of the metals. RDX and 40% dynamite will be used for the explosive charges. A review will be made of the publications concerning explosiforming transfer media in order to select 2 mediums in addition to powdered alumina. The Mo-1/2%Ti alloy will be processed at 1000 F, the Nb alloys at 800 to 1000 F, and the W at 1000 F. Polar coordinate grids will be placed on each blank by the photo-resist method for elongation measurements. The metal between the grid lines will be etched to a depth of 0.0005 to 0.001 inch.

AD-260 976 Div. 26, 17
(10 Aug 61) OTS price $1.60

Chromalloy Corp., West Nyack, N. Y.
EXPLOSIVE FORMING OF REFRACTORY METALS.
Bimonthly rept. no. 6, 1 June-31 July 60, by Richard L. Wachtell. Dec 60, 9p. incl. illus.
(Contract NOa(s) 59-6265-c)
Unclassified report

DESCRIPTORS: *Refractory materials, *Explosive forming, Molybdenum, Molybdenum alloys, Titanium alloys, Niobium, Tungsten, Sheets, Deformation, Microstructure, Heat resistant alloys, Metals.

Laue photograph patterns of explosively formed and not formed areas are presented, along with a photograph of the strain rate measuring set-up. The Laue pattern photographs were taken with unfiltered Cu radiation and a flat back reflection camera operating at 40 KV, 15 ma. Photo 83-A is taken from the clamp down region of the sheet where no forming took place, Photo 83-B from an area of maximum distortion. Slightly more strain is evident in the B regions than in the A and also slightly more orientation. (Author)

AD-260 977 Div. 26, 17
(10 Aug 60) OTS price $2.60

Chromalloy Corp., White Plains, N. Y.
EXPLOSIVE FORMING OF REFRACTORY METALS.
Bimonthly rept. no. 5, 1 Mar-30 Apr 60, by Richard L. Wachtell. 1 May 60, 20p. incl. illus. tables.
(Contract NOa(s) 59-6265-c)
Unclassified report

DESCRIPTORS: *Refractory materials, *Explosive forming, Molybdenum, Molybdenum alloys, Titanium alloys, Niobium, Sheets, Deformation, Microstructure, Explosives, RDX, Physical properties, Dies, Metals, Heat resistant alloys.

Explosive forming tests, some employing the photo-grid technique for elongation measurement were continued with 60 firings having been completed. Strain rate data and metal movement velocity were measured by strain gage/oscilloscope techniques. RDX and 15% dynamite were studied in this way, with three transmitting media, and the data are reported. Preliminary tests were conducted on Nb with partial success in some of the first five firings. Information is supplied on the microstructure and physical properties of the test materials. (Author)

Division 26-PRODUCTION AND MANAGEMENT

AD-261 031 Div. 26, 17
(10 Aug 61) OTS price $3.60

Stanford Research Inst., Menlo Park, Calif.
FEASIBILITY STUDY OF PLASMA WELDING OF REFRACTORY METALS.
Final rept.,
by Oliver Preston. 20 Feb 61, 34p. incl. illus. tables, 11 refs.
(Contract NOa(s) 59-6234-c)
Unclassified report

DESCRIPTORS: *Plasma physics, *Welding, *Refractory materials, Metals, Feasibility studies, Molybdenum, Tantalum, Tantalum alloys, Steel, Tungsten alloys, Tungsten, Tests.

A study was made of the feasibility of fusion welding of the refractory metals with the plasma torch. A torch with interchangeable nozzles of 1/16, 1/8, and 1/4 in. diameter was developed for this purpose. Welding with the conventional plasma torch was not possible, owing to severe blowing of the weld pool by the high-velocity gas jet. With a new type of plasma torch, designed to operate at very low gas flow rates, disturbance of the weld pool was eliminated, and fusion welds were produced in steel, Mo, Ta, W, and Ta-10% W alloy. However, the high heat-transfer rate, characteristic of the conventional plasma torch, was not obtained with the low-velocity jet. It was concluded that the inert-gas tungsten-arc and the electron beam are the most satisfactory methods for fusion welding of the refractory metals. (Author)

AD-261 037 Div. 26, 17, 12
(10 Aug 61) OTS price $4.60

Watervliet Arsenal, N. Y.
A STUDY TO IMPROVE WELD STRENGTH UNIFORMITY IN A CONTINUOUS ROD MAT BY RESISTANCE-PROJECTION WELDING,
by Keh-Chang Wu and Richard E. Lewis. Apr 61, 49p. incl. illus. tables (Technical rept. no. WVT RI 6101-R)
Unclassified report

DESCRIPTORS: *Rods, *Welding, Electric welding, Resistance, Mechanical properties, Steel, Stainless steel, Nickel, Nickel alloys, Copper alloys, Aluminum alloys, *Guided missile warheads, Welded joints.

A development program was conducted to investigate the application of resistance welding to fabrication of a continuous rod mat. Due to the geometry of the welding joint, projection resistance welding was considered most promising. Several types of inserted projections were investigated. An inserted flat shim proved to be most satisfactory. The purpose of using 422 modified stainless steel material for a shim was to obtain a high-strength joint, without using high-strength rod material which did not have the required bend ductility. The 422 modified stainless steel shim was used in both the FS 1018 steel and A-Ni rod joints. The weld joint having a 1/2-in.-long shim was as strong as one having a 3/4-in.-long shim. The optimum welding conditions were determined for rods of FS 1018 having both a 3/16-in. square and a 0.164-x 3/16-in. cross-section, and for A-Ni having a 0.164-in. square cross-section. The feasibility of using T-1, FS 4140, 304 stainless steel, K-Monel, and cupro-nickel (55-45) was also studied. (Author)

AD-261 052 Div. 26, 17
(11 Aug 61) OTS price $11.00

Allegheny Ludlum Steel Corp., Brackenridge, Pa.
MOLYBDENUM ALLOY EXTRUSION DEVELOPMENT PROGRAM.
Interim technical engineering rept. no. 2, 15 Nov 60-15 May 61 on Phase 2,
by P. A. Santoli. July 61, 139p. incl. illus. tables.
(Contract AF 33(600)40861, Proj. 7-785)
(ASC TR 7-785, vol. 2) Unclassified report

DESCRIPTORS: *Molybdenum alloys, *Extrusion, Processing, Preparation, Powder metals, Power metallurgy, Power alloys, Heat treatment, Melting, Mechanical properties, Forging, Dies, Chemical analysis, Zirconium alloys, Titanium alloys.

A process of producing and evaluating wrought and cast TZM (Mo + 0.50% Ti + 0.09% Zr + 0.02% C) for extrusion billets has been developed. The most suitable method involves wrought TZM in the recrystallized condition after primary working by extrusion of arc-cast ingots. A more uniform, fine grain structure is considered possible by subsequent rolling of the extruded and recrystallized material to the required billet size. Methods of chemical analysis, ultrasonic inspection, and metallographic examination were developed and considered reliable within certain process limits. The extrudability of wrought TZM in terms of response and surface finish was better than that of cast TZM as determined by extrusion at reduction ratios of about 11/1, 14/1, and 17/1 from the temperature range of 2600 to 3740 F. Room temperature and elevated tensile properties of as-forged and heat treated TZM were comparable to those reported for TZM of similar analysis and condition. (Author)

AD-261 053 Div. 26, 17
(11 Aug 61) OTS price $9.10

Alloyd Corp., Cambridge, Mass.
A STUDY OF ELECTRON BEAM WELDING.
Final summary rept.,
by H. J. Lander, W. T. Hess, and others.
21 July 61, 106p. incl. illus. 16 refs.
(Contract DA 19-020-ORD-5246, Proj. TB4-004)
(WAL 401.54/2-1) Unclassified report

DESCRIPTORS: *Welding, *Electron beams, Steel, Titanium alloys, Stainless steel, Molybdenum alloys, Tungsten, Tool steel, Mechanical properties, Impact shock, Aluminum alloys, Tin alloys, Vanadium alloys, Chromium alloys, Welded joints, Sheets, Metal plates, Refractory materials.

Five different Ti alloys, air-melted and vacuum melted hot-work die steel, cold-rolled stainless steel Mo-1/2 Ti alloy, and W were successfully electron beam welded in a variety of fusion zone widths varying from 0.050 to 0.300 inches. Impact resistance of fusion zones was generally found to be compatible with or higher than base plate values. Similarly, an increase in fusion zone ultimate strength, as compared to that of base plate, was noted. Some strength losses and general incremental ductility losses were reported. These results are correlated with interstitial gaseous content. (Author)

AD-261 199 Div. 26, 17, 22
(14 Aug 61) OTS price $1.60

Naval Ordnance Test Station, China Lake, Calif.
THE USE OF HIGH SPEED STEREOPHOTOGRAPHY IN

27. PROPULSION SYSTEMS

EXPLOSIVE METAL FORMING.
Rept. for 1 July 60-1 Apr 61,
by Rolland Gallup and John Pearson. 21 July 61,
18p. incl. illus. (NOTS TP 2698)
(NAVWEPS rept. no 7738) Unclassified report

DESCRIPTORS: *Metals, Metal plates, Aluminum, Deformation, Photographic analysis, Stereoscopes, High speed photography, Test methods, Test equipment, Explosives, Explosive forming.

A method is described by which high speed stereophotography and commercial aerial topographic analysis techniques can be used to obtain engineering data in the explosive forming of metal parts, and to study the dynamics of the forming process. The instrumentation and techniques for this method are discussed in terms of an actual problem, the explosive free-forming of an aluminum plate. Test results are presented. (Author)

AD-261 351 Div. 26, 33
(17 Aug 61) OTS price $1.60

Feltman Research Labs., Picatinny Arsenal,
Dover, N. J.
DESTRUCTIVE TESTING OF LOCKING RING AND TWIST LOCK CONTAINERS,
by William F. Schaufelberger. Aug 61, 15p.
incl. illus. table (Technical notes no. FRL TN 62)
Unclassified report

DESCRIPTORS: *Containers, Pressure, Seals, Failure (Mechanics), Atmosphere, Air transportation, Hydrostatic pressure, Tests, Gaskets, Test equipment, Temperature, Reliability, Packaging.

A description is given of the method used and the results obtained in testing both locking ring type and twist lock type containers for their ability to maintain structural integrity when subjected to internal pressure changes such as would be encountered during aerial transportation. The destruction point of the different containers tested is established. (Author)

AD-261 476 Div. 26, 17
(18 Aug 61) OTS price $10.50

Metcut Research Associates, Cincinnati, Ohio.
MACHINING OF REFRACTORY MATERIALS.
Technical engineering rept. on Phase 2, 1 May-31 July 61,
by L. J. Nowikowski, N. Zlatin, and M. Field.
Aug 61, 140p. incl. illus. tables.
(Contract AF 33(600)42349)
(AMC TR 7-532a, vol. 3) Unclassified report

DESCRIPTORS: *Heat resistant alloys, *Metals, *Refractory materials, *Machining, Tungsten, Steel, Cobalt alloys, Chromium alloys, Nickel alloys, Molybdenum alloys, Titanium alloys, Aluminum alloys, Drilling machines, Milling machines, Lathes, Cutting tools, Carbide tools, Machine shop practices, Grinders, Cutting fluids, Machine tools.

Machining studies were performed on pressed and sintered unalloyed tungsten, Rene 41 solution treated to 321 BHN, Rene 41 aged to 365 BHN, and D6AC steel quenched and tempered to 56 and 58 Rockwell C. The investigation consisted of turning, face milling, and end milling tests on tungsten; turning, face milling, end milling, drilling, reaming and tapping tests on Rene 41; and turning, face milling and drilling tests on D6AC steel. (Author)

AD-260 875 Div. 27, 12, 14
(8 Aug 61) OTS price $1.10

High Temperature Materials, Inc., Boston, Mass.
PYROLYTIC CARBIDE DEVELOPMENT PROGRAM.
Monthly progress rept. no. 15, 1-30 June 61.
30 June 61, 6p. incl. illus.
(Contract NOw 60-0292)
Unclassified report

DESCRIPTORS: *Carbides, *Refractory materials, *Rocket motor nozzles, Refractory coatings, Niobium compounds, Hafnium compounds, Tantalum compounds, Pyrolysis, Processing, *Guided missiles, Underwater-to-surface, Surface-to-surface, Coatings, Chlorides, Materials.

Two symmetric Polaris nozzles were coated with niobium carbide during the investigation of the carbide coating of full scale nozzles. A concentrated effort was made to eliminate non-uniformity of deposits and the non-reproducibility of deposition rates due to growth formations on injector tips. An injector evaluation study has resulted in improved injector performance. One hafnium carbide coated nozzle was fired for evaluation; the coating failed in five seconds. (Author)

AD-260 896 Div. 27, 12, 14
(9 Aug 61) OTS price $1.10

Kidde, Walter, and Co., Inc., Belleville, N. J.
FIBERGLASS MOTOR CASE STUDY. POLARIS SECOND STAGE END CLOSURE.
Progress rept. 1-31 July 61,
by T. Siuta. 31 July 61, 4p. (Rept. no. 3642-4)
(Contract NOw-61-0497-c)
Unclassified report

DESCRIPTORS: *Guided missiles, Surface-to-surface, *Rocket cases, Rocket motors, *Glass textiles, *Filament wound construction, Aerodynamic configurations, Reinforcing materials, Design, Pressure vessels, Deflection, Deformation, Stresses, Hydrostatic pressure, Tests, Model tests, Test methods, Rocket research, Underwater-to-surface.

A fixture was fabricated to carry out hydrostatic deflection tests. The two specimens tested were manufactured using standard electrical (E) glass (PO-16); the resin was Dow 332 with Shell 0801 catalyst. One of the specimens was reinforced in girth direction at the equator with a 3/16 in. thick layer of circumferential windings approximating 2 in. wide. Test results showed that a noticeable reduction in deflection was achieved with the configuration reinforced in girth direction. The unreinforced specimen ruptured at 925 psig; the reinforced at 1075 psig. The rubber liner and polar fitting configuration was redesigned to eliminate leakage.

AD-260 912 Div. 27, 17, 26
(9 Aug 61) OTS price $11.50

Pratt and Whitney Aircraft, East Hartford, Conn.
RESEARCH AND DEVELOPMENT OF TITANIUM ROCKET MOTOR CASE.

Division 27-PROPULSION SYSTEMS

Quarterly rept. no. 3, 1 Jan-31 Mar 61,
by R. P. Brody and Frank A. Crosby. 29 Apr 61,
152p. incl. illus. tables (Rept. no. PWA-1955)
(Contract DA 19-020-ORD-5230, Proj. TB4-004)
(Rept. no. WAL TR 766.2/1-2) Unclassified report

DESCRIPTORS: *Rocket cases, *Titanium alloys, Forging, Welding, Manufacturing methods, Mechanical properties, Heat treatment, Arc welding, Electron beams, Crystal structure, Microstructure, Aluminum alloys, Chromium alloys, Vanadium alloys.

A cathodic hydrogenation technique was developed for H analysis of cold-rolled sheet stock aged to 180,000 psi yield strength. The results indicate that the 200 ppm H level is not detrimental. An O content in the 0.10 to 0.20% range has a pronounced effect on the aging response of press-forged B-120VCA Ti alloy at 900 F. The G sub c test showed greater consistency and better correlation with yield strength than the modified Charpy impact and instrumented-bend tests for determining the fracture toughness of thin sections (0.080 in.) of high yield strength (180,000 to 200,000 psi) flow-turned material. The results of open-die press forging at various strain rates and temperatures indicated that forging at 1700 F with relatively low strain rates produced the least variation in mechanical properties after aging at 900 F. Closed-die press forging in dogbone dies produced excellent grain flow and grain size. Closed-die hammer-forged pancakes were similar in microstructure to that of open-die press-forged pancakes. Single-pass ring rolling to size at 1800, 1900, or 2000 F was considered satisfactory.

AD-261 153 Div. 27, 12, 20
(14 Aug 61) OTS price $3.60

General Dynamics/Convair, San Diego, Calif.
PRELIMINARY ANALYTICAL STUDY OF A NUCLEAR TURBO-GENERATOR SPACE POWER CYCLE UTILIZING A CHEMICALLY-REACTING GAS AS A WORKING FLUID,
by R. E. Forrette. 4 Aug 61, 31p. incl. illus.
(Rept. no. ERR-SD-135)
Unclassified report

DESCRIPTORS: *Spaceships, *Nuclear power plants, *Thermal radiation, Thermal utilization, Gases, *Radiators, Heat of reaction, Chemical reaction, Recombination reactions, Dissociation, Turbines, Vapor, Gas turbines, Steam turbines, Manned, Power plants, Sulfur compounds, Oxides, Oxygen, Enthalpy, Entropy.

A preliminary analytical study of a nuclear turbo-generator space power system is carried out. The system utilizes the heat of reaction of a chemically-reacting gas as a method of energy exchange. The reacting-gas cycle is compared to the basic Brayton gas cycle and the Rankine vapor cycle on the basis of radiator area per unit power output. The comparison indicates that the performance of the reacting-gas cycle is markedly superior to that of the Brayton cycle, and may potentially equal or surpass the Rankine vapor cycle performance, provided appropriate gas reactions may be developed and optimized, for the given cycle requirements. (Author)

AD-261 186 Div. 27, 17, 26, 12
(14 Aug 61) OTS price $1.60

Mellon Inst. of Industrial Research, Pittsburgh, Pa.
THE EVOLUTION OF ULTRA-HIGH STRENGTH STEELS, AND RESEARCH ON MATERIALS AND VARIOUS NOVEL TECHNIQUES OF FABRICATION OF HIGH PERFORMANCE ROCKET MOTOR CASES.
Progress rept. no. 39, 1-31 July 61,
by G. K. Bhat. 31 July 61, 21p. incl. illus. tables.
(Contract NOrd-18169)
Unclassified report

DESCRIPTORS: *Steel, Mechanical properties, Rocket motors, *Rocket cases, Materials, Filament wound construction, Wire, Aluminum wire, Beryllium, Drawing (Machine processing), Manufacturing methods, Processing, Melting, Heat treatment, Tensile properties, Microstructure, Welding, Arc welding, Ultrasonics, Tests, Corrosion, Stresses.

Tensile tests on 0.0045-in.-diam Be wire indicate that the Be wire is about twice as strong as 6061-T-913 Al alloy wire. Two epoxy bonded Al-filament wound 10-in.-diam spheres are in progress. Fatigue studies on air-melted Rocoloy 270 indicate that austenitization temperatures above and below the optimum temperature reduce the endurance limit and fatigue life. Analyses of the mechanical properties of MX-2 hydrospun vessel were completed. The parent hydrospun material had better properties than the weld material in the circumferential direction but lower properties in the longitudinal direction. The use of ultrasonic vibrations to produce very fine microstructure in welds was demonstrated. No failures are reported of any specimens of MX-2 and Rocoloy 270 subjected to stress corrosion evaluation.

AD-261 214 Div. 27, 17
(14 Aug 61) OTS price $1.10

Stanford Research Inst., Menlo Park, Calif.
TUNGSTEN AND ROCKET MOTORS.
Progress rept. no. 13, May-June 61,
by Gerald M. Gordon and David S. Bloom.
30 June 61, 5p. incl. table.
(Contract NOrd-18619)
Unclassified report

DESCRIPTORS: *Tungsten, *Rocket motor nozzles, Exhaust gases, Exhaust nozzles, Solid rocket propellants, Aluminum compounds, Materials, Oxides, Chemical reactions, Thermal stresses, Erosion, Plasma jets, Exhaust flames, Test equipment, Simulation.

The design of the special plasma-jet head called for a rear electrode consisting of concentric copper tubes to which a W button is brazed. Many difficulties were experienced, but successful brazing was finally achieved with a special tip configuration in an H atmosphere using induction heating. The tip was ground to the proper geometry and the new plasma head is ready for firing. A thermal-shock apparatus was constructed that employs a modified consumable-arc furnace for the power source and a vacuum chamber. A Ta or W tube is used as a resistance-heating element. The tube can be heated from ambient temperature to 3000 C in less than 5 seconds. The initial W test specimens are being fabricated as pressed and sintered rings. The rings are slid onto the heating element and are held in place by tight-fitting top and bottom heat shields that prevent the ring edges from heating by radiation. The specimens are thus heated rapidly from the inside surface, simulating actual rocket nozzle heating conditions. (Author)

AD-261 215 Div. 27, 17
(14 Aug 61) OTS price $1.10

Stanford Research Inst., Menlo Park, Calif.
TUNGSTEN AND ROCKET MOTORS.
Progress rept. no. 14 for period ending July 61, by David S. Bloom. 31 July 61, 4p. incl. illus. (Contract NOrd-18619)
Unclassified report

DESCRIPTORS: *Tungsten, *Rocket motor nozzles, Exhaust gases, Exhaust nozzles, Solid rocket propellants, Aluminum compounds, Oxides, Chemical reactions, Thermal stresses, Erosion, Plasma jets, Exhaust flames, Simulation, Test equipment, Materials.

The plasma-jet rocket-exhaust simulator was successfully fired at various power levels and Ar flow rates. After about 12 firings of from 5 to 15 sec, the brazed joint between the Cu and W electrode developed a leak in the cooling water system. Progress is reported on instrumentation of the W thermal shock test specimens. Chromel-Alumel thermocouples were attached by spot welding to the inside surface and Fe-Constantan thermocouples to the outside surface of the sintered W ring specimen. Interference was encountered from the strong pulsating magnetic field around the thermocouple leads and from the power rectifiers which were broadcasting 180-c electromagnetic waves. Shielding of the thermocouples was necessary and the temperature recording equipment was placed about 30 ft from the current rectifiers. Temperature versus time data are presented for a W ring of 76% theoretical density. W rings with densities as high as 93.4% of theoretical density have been produced by sintering 1 hr at 2550 C.

AD-261 263 Div. 27, 12, 17
(15 Aug 61) OTS price $1.10

Lyon, Inc., Detroit, Mich.
DEEP DRAWN PRE-PRODUCTION UNITS. A2 1ST STAGE POLARIS ROCKET MOTOR CHAMBERS AND A2 1ST STAGE POLARIS AFT CLOSURES.
General rept. no. 8, 31 Mar-30 Apr 61. 30 Apr 61, 6p.
(Contract NOw 60-0630)
Unclassified report

DESCRIPTORS: *Guided missiles, Underwater-to-surface, Surface-to-surface, *Rocket cases, Rocket motors, Booster rockets, Steel, Drawing (Machine processing), Dies, Tools, Machine tools, Metal forming presses, Hydraulic presses.

Progress is reported on special tooling drawings, tryout and development of the thrust port final restrike and sizing die assembly, and rough machining prior to heat treatment of 4 Tricent (300-M) aft closures for the A2 first stage Polaris motor chamber.

AD-261 415 Div. 27, 26, 25
(16 Aug 61) OTS price $2.60

Redstone Div., Thiokol Chemical Corp., Huntsville, Ala.
DEVELOPMENT OF AN INFRARED INSPECTION TECHNIQUE.
Interim technical progress rept. no. 1, 27 Feb-27 May 61.
7 Aug 61, 27p. incl. illus. (Rept. no. 31-61)
(Contract DA 01-021-ORD-1267)
Unclassified report

DESCRIPTORS: *Non-destructive testing, Test methods, Quality control, *Rocket motors, Solid rocket propellants, *Infrared equipment, Bonding, Bonded joints, Rocket cases, Heat transfer, Mathematical analysis, Theory, Thermal conductivity, Design, Infrared detectors.

Research is concerned with the development of a rapid and reliable infrared inspection technique for detecting bonding flaws in solid propellant rocket motors. It is not the intent of this analysis to investigate the aspects of the radiative heat transfer but to study the various conduction heat transfer phenomena which are manifested as temperature gradients at the motor surface. General solutions to a wide variety of problems were obtained to gain a fundamental understanding of the effects of bonding flaws on surface temperature. To relate the analyses to known conditions, specific problems were numerically evaluated and are presented. To obtain an understanding of the effects of bonding flaw depth on the surface temperature difference, heat conduction through the case, liner, and propellant was analyzed for sound bonding at every interface. For comparison, the temperature resulting from lack of bonding at each of the interfaces as well as the temperature resulting from a void in the propellant were considered. (Author)

AD-261 443 Div. 27, 10
(18 Aug 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
FILTER CLOGGING BY TC-1 JET-FUEL SEDIMENT.
7 July 61, 2p. (AID rept. 61-100; Trans. from Composition of Deposits Formed on Fuel Filters of Transport Jet Aircraft; Khimiya i Tekhnologiya Topliv i Masel 4:57-60, Apr 61)
Unclassified report

DESCRIPTORS: *Jet engine fuels, *Fuel filters, Aviation fuels, Fuel systems, Contamination, Sedimentation, Chemical impurities, Storage, Effectiveness, USSR, Deposits.

A study of sediment from TC-1 fuel which clogs fuel-system filters of transport jet aircraft and refueling-unit filters is reported. On the fuel-system filter, sediment formed at 45 to 50 C, while in the refueling units sediment formation took place at the ambient temperature. The inorganic component of the refueling-unit sediment differed from that of the aircraft in higher Fe and Zn contents, while the ash-forming elements remained at approximately the same level (46%). Na was found in much smaller quantities than in the aircraft sediment. In both cases considerable contamination by ground dust was found. The refueling-unit sediment contained a smaller amount of the organic component than the aircraft sediment, except in one case. A suggestion was made that jet fuels be stored in hermetic reservoirs provided with corrosion-resistant linings and that fuel to be dispensed be filtered until complete removal of mechanical impurities with particle size over 1 to 2 microns is achieved. (Author)

28. PSYCHOLOGY AND HUMAN ENGINEERING

AD-260 993 Div. 28, 30, 23
(10 Aug 61) OTS price $7.60

Human Resources Research Office, George Washington U., Washington, D. C.
WORK PROGRAM FOR FISCAL YEAR 1962.
30 June 61, 74p.
Unclassified report

DESCRIPTORS: Training, *Research program administration, *Leadership, Job analysis, Guided missile personnel, Military personnel, Effectiveness, Combat, *Military training, Human engineering.

AD-260 994 Div. 28
(9 Aug 61) OTS price $1.60

Army Infantry Human Research Unit, Fort Benning, Ga.
SOME FACTORS WHICH HAVE CONTRIBUTED TO BOTH SUCCESSFUL AND UNSUCCESSFUL AMERICAN INFANTRY SMALL-UNIT ACTIONS,
by John B. McKay, Salvatore Cianci and others.
Apr 59, 9p. 30 refs. (HumRRO research memo. no 13)
(In cooperation with Human Resources Research Office, George Washington U.)
Unclassified report

DESCRIPTORS: *Military personnel, *Combat, Military organizations, Selection, Weapons, Military operations, *Group dynamics, Effectiveness.

A search of American Infantry small-unit combat literature of World War II and the Korean Conflict has yielded information concerning some of those factors in American employment of battlefield techniques that have figured in differentiating successful from unsuccessful small-unit actions. The factors are (1) supporting fires; (2) control and communications; (3) preparation for conditions on the battlefield; (4) information dissemination; (5) availability of time for planning; (6) accurate and timely reporting, (7) security and surprise; (8) combat losses of key personnel; (9) choice of weapons and personnel for specific missions; and (10) dispersion and tactical utilization of terrain. These ten factors are not presented as the only factors that have contributed to both successful and unsuccessful small-unit actions. Premises for Task PLATTRAIN have been derived from the contents of this paper. (Author)

AD-261 001 Div. 28, 16
(10 Aug 61) OTS price $2.60

Womack General Hospital, Fort Bragg, N. C.
FIRST COURT-MARTIAL SCREENING PROGRAM PILOT STUDY.
Progress rept. 1 July 60-30 June 61,
by Robert S. Nichols, 30 June 61, 20p. incl. tables.
(Proj. no. 6X-97-87-001)
Unclassified report

DESCRIPTORS: *Courts martial, Test methods, Selection, *Military personnel, *Military psychology, Behavior, *Psychotherapy, Identification, Classification, Effectiveness, Psychology.

Offenders' backgrounds, the value of screening and treating them, and the administrative and professional problems involved were studied (AD-239 422). Of 450 offenders, 150 are controls, 150 are evaluated but not helped, and 150 are evaluated and treated as indicated. Six months follow-up data exist for 335 cases. Offenders compared with average soldiers, are younger, have less education, service, and rank, lower character and efficiency, and more AWOL's. They do not differ with respect to intelligence and volunteer status. Offenses are more common among Negroes. Military offenses (chiefly AWOL) predominate. Personal characteristics and unit differences alter offense rates. Preliminary data indicate those in the treated group received more discharges for ineffectiveness than control offenders. It was impossible to give routine treatment because of the administrative problems and professional problems such as delayed report of trial, broken appointments, temporary absence of offender and other delays in evaluation and treatment. Offenders lacked concrete problems, were negativistic, and unmotivated. The professional staff was pessimistic about treatment outcome, and increasingly doubted the effectiveness of the program. These factors, plus number of offenders involved (50% above routine workload), make individual screening unwise. A field program of professional consultation with commanders on management of ineffectives may be a better technique. (Author)

AD-261 002 Div. 28
(10 Aug 61) OTS price $1.60

Maryland U., College Park.
PROCESSING OF PERCEPTUAL INFORMATION,
by Murray Glanzer. June 61, 14p. incl. illus. tables.
(Contract DA 49-007-md-1004)
Unclassified report

DESCRIPTORS: *Perception, Processing, Measurement, *Visual perception, Test methods, Coding, Display systems.

The purpose of the study was to measure the accuracy with which subjects perceived horizontal arrays of black and white figures, and to analyze the determinants of this accuracy. Two groups of subjects were shown arrays of black and white figures under conditions of brief exposure. Accuracy of the perception of these arrays was demonstrated to be a function of the number of runs (homogeneous color units) in the array. Further analysis of the determinants of accuracy furnished the basis for a tentative model of the mechanism used in perceiving the arrays. On the basis of variables associated with this mechanism, between 63% and 73% of the variance in array difficulty can be accounted for. (Author)

AD-261 083 Div. 28, 6
(11 Aug 61) OTS price $1.60

Human Engineering Labs., Aberdeen Proving Ground, Md.
THE EFFECTIVENESS OF VARIOUS SPOTTING TECHNIQUES IN FIRE CONTROL: A PILOT STUDY,

by Sam Glucksberg and Hugo L. Klein. June 61, 11p. incl. illus. table (Technical memo. no. 9-61)
(Proj. TB 1-1000)

Unclassified report

DESCRIPTORS: *Spotting rounds, Simulation, Spotlights, Targets, Target recognition, *Fire control, Reliability, Range finding, Effectiveness, Display systems, *Human engineering.

Spotlights were used to simulate spotting bursts in an investigation of several spotting techniques. Thirty-two subjects estimated distances from specified lights to a target. Comparisons of accuracy under the following conditions were made: (1) one light vs two lights; (2) simultaneous vs. serial presentation of lights; and (3) reference distance between lights given vs no given reference. No reliable differences were obtained between any conditions. Distance estimation was found to be extremely poor under the conditions used. It was concluded that the spotlights could not be used as burst simulators because of their visibility when OFF. (Author)

AD-261 122 Div. 28
(10 Aug 61) OTS price $1.60

Maryland U., College Park.
THE MECHANICS OF CONCEPT WORK: STORAGE LOAD AND SELECTION LOAD,
by Murray Glanzer and Janellen Huttenlocher. June 61, 10p. incl. illus. table.
(Contract DA 49-007-md-1004)

Unclassified report

DESCRIPTORS: *Reasoning, Memory, *Perception, Learning, Test methods, *Psychometrics.

The results of an earlier study indicated that the subject solving concept problems carries out two distinct functions--the storage of dimension values and the selection of relevant dimensions. On the basis of those results, it was argued that the information load on the storage and selection functions determines the efficiency of the concept-work. In this study, the load on these two functions was varied and the effect of the variations measured. Four classes of concept problems were constructed: (1) Low storage, low selection load, (2) Low storage, high selection load, (3) High storage, low selection load, and (4) High storage, high selection load. Thirty subjects solved a series of 80 problems, 20 of each type. The results show clear and significant effects of both storage and selection load. The nature of load and the general implications of the findings for concept-work are discussed. (Author)

AD-261 331 Div. 28
(17 Aug 61) OTS price $3.60

Boeing Co., Wichita, Kans.
A COMPARISON OF SINUSOIDAL AND RANDOM VIBRATION EFFECTS ON HUMAN PERFORMANCE.
Rept. on Research on Low Frequency Vibration Effects on Human Performance.
28 July 61, 34p. incl. illus. tables (Technical rept. no. 2; Document no. D3-3512-2)
(Contract Nonr-299400)

Unclassified report

DESCRIPTORS: *Human engineering, Reaction (Psychology), *Vibration, Tracking, Tests, Man, *Stress (Psychology), Stress (Physiology).

Ten male subjects performed a complex task during vertical vibration in a preliminary study to compare performance with sinusoidal, constant period random amplitude, and random (aircraft turbulence) vibration. Performance on the three subtasks varied: performance on a tracking task with delayed control-display feedback was differently affected according to type of vibration; no affect was found for a tracking task without feedback delay; and response time did not change. Results were analyzed for consistent trends in vibration effects which could be correlated with mechanical and psychological definitions of vibration for evidence of a human performance transfer function for vibration. Psychological and amplitude bases for this function could not be found, vibration acceleration (g) effects were not clear, and RMS amplitude power was correlated with constancies in performance. It was suggested that testing combinations of RMS and frequency (and related factors) could lead to a performance transfer function permitting transformation of human performance data from sinusoidal to operational vibrating environments. (Author)

AD-261 352 Div. 28
(16 Aug 61) OTS price $1.60

Florida U., Gainesville.
DISINHIBITION IN COMPOUND CONDITIONING AS A FUNCTION OF THE NUMBER OF REINFORCEMENTS OF A SINGLE CONDITIONED STIMULUS.
Technical rept. no. 3 on Transfer of Training Between Sensory Modes,
by H. D. Kimmel and R. L. Fowler. June 61, 15p. incl. illus. tables.
(Contract Nonr-58009)

Unclassified report

DESCRIPTORS: *Conditioned reflex, Tests, Stimulation, Galvanic skin response, Reaction (Psychology).

A test was made of the hypothesis that the relationship between the number of reinforcements and the magnitude of the conditioned GSR would differ depending upon whether the original CS was employed in the test situation or a compound CS containing the original CS and an extra stimulus of another sense modality was used. The results showed that the relationship between magnitude of GSR to the compound CS and number of reinforcements was positive and that the magnitude of GSR to the single CS and number of reinforcements went up from four to eight reinforcements and down from eight to twelve reinforcements. In spite of the only marginal statistical support given to the hypothesis in the light-CS group only, the results were interpreted as being in essential agreement with the theoretical notion from which the prediction was generated. It was pointed out that the specificity and complexity of the predicted interaction, and the fact that it was generated a priori from theory based on only meager prior data, added to the significance of the results obtained. (Author)

29. QUARTERMASTER EQUIPMENT AND SUPPLIES

AD-260 894 Div. 29, 20, 16
(24 Aug 61) OTS price $12.50

Quartermaster Research and Engineering Command, Natick, Mass.
PRESERVATION OF FOOD BY LOW-DOSE IONIZING ENERGY.

Jan 61, 171p. incl. illus. tables, 232 refs.
Unclassified report

DESCRIPTORS: *Food, *Radiation effects, Dosage, Preservation, Dosimeters, Effectiveness, Packaging, Acceptability, Vegetables, Fruits, Meat.

Research on preservation of food by ionizing energy has encompassed both high dosage and low dosage studies. The results from the former, particularly in regard to energy sources, dosimetry, dose distribution, induced radioactivity and wholesomeness, are almost entirely applicable to the latter. The major differences between the two dosage ranges lie in the sensory effects on the food items and in the packaging requirements. Among the meats, pork has responded best to irradiation processing in regard to flavor. At the low dose range, flavor change in pork is imperceptible. Chicken also is most promising. Marine products are improved by low dose treatment so that increased distribution and marketing channels may be utilized. Vegetables, because of their delicate structure, are easily damaged by comparatively small dosages of radiation. Fruits present a stimulating field for further study because they are preferred especially for their fresh natural flavors. Strawberries, grapes, peaches, tomatoes, and citrus fruits have shown promise at radiation dosage ranges between 200,000 and 800,000 rad. The enormous nutritional and toxicity study is approaching its final phases including detailed histopathology and very long-term carcinogenic and enzymological experimentation. There is no radioactivity induced in the food products by any irradiation process contemplated to be used for food production. Results indicate that no serious problems exist in packaging in the low dose range. (Author)

AD-260 957 Div. 29, 20
(11 Aug 61) OTS price $1.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
PROTECTION OF EXPOSED PARTS OF SHELTERS AGAINST THERMAL RADIATION FROM MEGATON WEAPONS.
Final rept.,
by F. W. Brown, III and A. Y. Eliason.
28 July 61, 18p. incl. illus. 17 refs (Technical rept. no. 150)
Unclassified report

DESCRIPTORS: *Shielding, *Thermal radiation, Shelters, Effectiveness, Radiation effects, Nuclear weapons, Protective coverings.

A theoretical study is made to determine the effects on the exposed parts of underground shelters of thermal radiation from the explosion of nuclear weapons. Simple carbon and graphite shields are discussed, and more sophisticated shielding systems are proposed for future experimental studies. (Author)

AD-261 011 Div. 29, 13
(9 Aug 61) OTS price $1.10

Naval Ordnance Test Station, China Lake, Calif.
CABLE CLIMBER,
by Lee E. Humiston. June 61, 3p. incl. illus.
(Technical brief no. 4; NOTS TP 2684)
Unclassified report

DESCRIPTORS: *Climbing irons, Safety.

This device was evolved from a consideration of the problems involved when it became necessary to ascend or descend various heights under conditions where it was impracticable to obtain a ladder, where the height involved was greater than that scalable by any normal ladder, or under emergency conditions. The Cable Climber consists of two units that are basically identical, except that the foot unit has stirrups to fit over the instep and a heel clamp, whereas the hand unit has knurled handgrips. The prototype unit can only be operated on free-swinging cables, but a unit is being developed that would enable the Cable Climber to be attached, by a quick-attach-and-release mechanism, to any cable anchored at both ends. Units could be manufactured to operate on any desired cable size. (Author)

30. RESEARCH AND RESEARCH EQUIPMENT

AD-260 823 Div. 30, 15, 8
(8 Aug 61) OTS price $5.60

Diamond Ordnance Fuze Labs., Washington, D. C.
RELIABILITY AND COMPLETE ENVIRONMENTAL TESTING,
by E. W. Chittenden. 5 June 61, 57p. incl. illus. tables (DOFL rept. no. TR-936)
(Proj. 20124)
Unclassified report

DESCRIPTORS: *Reliability, Mathematical analysis, *Intermediate frequency amplifiers, *Electronic equipment, Temperature, Vibration, Pressure, Guided missiles, Acceleration, Test methods, Shock, *Instrumentation, Satellites, Subminiature electron tubes, *Test equipment.

The designer of a new and complex instrument for use in missiles is unable to predict the probable percentages of successful operation from tests because of the small number of models available. Analysis of the physical basis for high reliability suggests that confidence in an instrument can be obtained by a method of complete environmental testing that is formulated mathematically herein. This method has been applied to the testing of a family of high quality amplifiers in an environmental chamber permitting continuous and simultaneous variation of temperature, atmospheric pressure, and vibration, with the result that the designers obtained greatly increased confidence in the survival capability of the instrument. (Author)

AD-260 922 Div. 30, 8
(9 Aug 61) OTS price $2.60

Radiation, Inc., Palo Alto, Calif.
SUPER-POWER KLYSTRON TUBE-TEST FACILITY.
Quarterly rept. no. 2, 1 Jan-31 Mar 61,
by Roby L. Blessing. 31 Mar 61, 20p. (Rept. no. G-108-Q2)
(Subcontract to Varian Associates, Palo Alto, Calif.)
Unclassified report

DESCRIPTORS: *Klystrons, Electron tubes, *Test facilities, Pulse transformers, Modulators, Modulator tubes, Magnets, Resistors, Construction, Design, Power supplies, Test equipment, Cooling.

Design and construction efforts were continued

on the Klystron test facility. A major effort was made to complete the specification of the interim modulator pulse transformers necessitated by the increase in system capacity. Approval was obtained to include six additional magnet supplies in the system. The required procurements and drawings were produced and the assemblies required for these magnet supplies are in or awaiting active production. Approval was also obtained for the switch tube test supply. This phase of the program received considerable effort so as to construct the power supply within the shortest possible period of time. The construction schedule is being maintained compatible with the projected switch tube test program and final modulator design. The design of the power supply was completed. (Author)

AD-260 947 Div. 30, 8
(8 Aug 61) OTS price $1.10

Lincoln Lab., Mass. Inst. of Tech., Lexington.
EVALUATION OF THREE MICROWAVE DENSIOMETERS,
by S. J. Miller and F. I. Sheftman. 21 July 61, 3p. tables (Rept. no. 46G-0012)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: *Density sensitive, Indicators, *Radiation hazards, Microwaves, Antennas, Ultra high frequency, Antenna horns, Dipole antennas, Superhigh frequency, Tests, Electromagnetic fields.

Three commercially available densiometers, were evaluated. Measurements were made at 425, 900, 1300, 2850, and 5300 mc. The results of the tests show that none of the densiometers tested is suitable in all respects. The error at UHF is in the order of 6db, but is in the direction to insure personnel safety. At 900 mc the error is in the order of 1.8db, but again in the conservative direction. When horns are used as the pick-up antenna, the correlation is within 1db. Continuous coverage could be obtained by using more horns with properly chosen attenuators to compensate for gain variation, if necessary. (Author)

AD-260 998 Div. 30, 17, 20
(10 Aug 61) OTS price $1.10

Kaman Aircraft Corp., Bloomfield, Conn.
DEVELOPMENT AND FABRICATION OF NON-DESTRUCTIVE SPECIFIC GRAVITY MEASURING EQUIPMENT EMPLOYING RADIATION TECHNIQUE,
Monthly progress rept. 1-31 Mar 61.
Mar 61, 6p. incl. illus. (Rept. no. 58-92-PR-31)
(Contract DA 19-059-501-ORD-2631, Proj. TA2-8051)
Unclassified report

DESCRIPTORS: *Non-destructive testing, Density, Design, Measurement, Test equipment, Radioactivity, Gamma rays, *Density sensitive indicators, Radiographic analysis, Radiation instruments, Physical properties, Cobalt, Isotopes, Micrometers, Optical instruments, Sources.

Optical survey techniques were used to determine that the surface table on which the cobalt sources, the sample carriage, the Johanssen block housing, the chopper and the micrometer heads are mounted was sufficiently flat and level. The translating mechanism which drives the sample carriage (to cause different sectors of the sample to be placed in the beam) was completely designed. (Author)

AD-260 999 Div. 30, 20, 17
(10 Aug 61) OTS price $1.10

Kaman Aircraft Corp., Bloomfield, Conn.
DEVELOPMENT AND FABRICATION OF NON-DESTRUCTIVE SPECIFIC GRAVITY MEASURING EQUIPMENT EMPLOYING RADIATION TECHNIQUE,
Monthly progress rept. 1-30 Apr 61,
Apr 61, 3p. (Rept. no. 58-92-PR-32)
(Contract DA 19-059-501-ORD-2631, Proj. TA2-8051)
Unclassified report

DESCRIPTORS: *Non-destructive testing, Density, Design, Measurement, Test equipment, Radioactivity, Gamma rays, *Density sensitive indicators, Radiographic analysis, Radiation instruments. Physical properties, Cobalt, Isotopes, Sources, Servo systems.

The test table components, which consist of the large and small cobalt sources, the chopper assembly, the chopper drive motor, and the servo block housing were placed on the spacers and properly aligned by optical bore sighting. The spacer dimensions were suitable and periodic observations indicated that no mechanical stability problems are present. (Author)

AD-261 045 Div. 30
(9 Aug 61) OTS price $4.60

Naval Ordnance Lab., White Oak, Md.
HIGH TEMPERATURE MATERIALS TEST FACILITIES AT THE NAVAL ORDNANCE LABORATORY,
by F. J. Koubek and A. R. Timmins. Apr 61, 46p. incl. illus. tables.
(NAVWEPS rept. no. 7315) Unclassified report

DESCRIPTORS: *Test facilities, Test equipment, *High temperature research, Oxygen, Acetylenes, Hydrogen, Liquefied gases, Cutting torches, Rocket motors, Electric arcs, Rocket motor nozzles, Thermal insulation, Insulating materials, Ablation, Naval research laboratories, Refractory materials, Laboratory equipment, Design.

Test facilities for the evaluation of materials at very high temperatures and heat fluxes are described. These are: an oxy-acetylene burner, a hydrogen-oxygen rocket motor and a fluid stabilized electric arc. The oxy-acetylene burner is used for ablation studies and rocket insulation materials evaluation. The hydrogen-oxygen rocket motor is utilized for screening rocket nozzle and insulation materials. The fluid stabilized arc is used for ablation studies and general materials evaluation. Characteristics of these test facilities along with heat flux study data are given. Future plans are also discussed. (Author)

AD-261 072 Div. 30, 27, 25, 9
(11 Aug 61) OTS price $1.60

General Dynamics/Convair, San Diego, Calif.
CRYOFUMPING ROCKET EXHAUST PRODUCTS AT HIGH THROUGH PUTS AND LOW PRESSURE,
by R. O. Barkdoll and J. W. Anderson. 1960, 14p. incl. tables.
Unclassified report

DESCRIPTORS: *Rocket motors, *Altitude chambers, *Exhaust gases, Thermal radiation, Measurement, Design, Feasibility studies, Test facilities, Instrumentation, Tests, Model tests, *Heat transfer, *Pumps, *Cryogenics, *Gas flow, Heat exchangers, *Refrigerant condensers.

Preliminary analyses are presented for the design of a cryopumping system to freeze out large mass flow rates of rocket exhaust products. The controlling design factors, results of preliminary analysis, and test data to show feasibility, are included. This investigation was initiated to support the rocket exhaust plume radiation studied conducted at Convair. The aim was to remove the products of combustion of a 100 lb. thrust engine burning JP-4 and gaseous oxygen within a 12 foot diameter tank 20 feet in length. The desired background pressure surrounding the nozzle was 1/1000 mm of Hg. The series of measurements being taken required rocket operation of a period up to 3 minutes. (Author)

AD-261 113 Div. 30, 8
(11 Aug 61) OTS price $10.50

Stanford Electronics Labs., Stanford U., Calif.
IMPROVING RELIABILITY OF DIGITAL SYSTEMS BY REDUNDANCY AND ADAPTION,
by W. H. Pierce. 17 July 61, 121p. incl. illus. tables, 20 refs. (Technical rept. no. 1552-3)
(Contract Nonr-22524, Proj. NR 373 360)
Unclassified report

DESCRIPTORS: *Digital systems, Reliability, Mathematical logic, Mathematical prediction, *Electrical networks, *Electronic circuits, Probability, Feedback, *Digital computers, Matrix algebra, *Switching circuits, Mathematical analysis, Statistical analysis, Subminiature electronic equipment, Errors.

Redundancy and adaption will have engineering value in improving the reliability of digital systems if they can provide reliability not otherwise attainable, or if they can provide reliability more economically than other methods. The specific methods of using linearly separable decision elements proposed in this thesis show promise of value by both of the above criteria. Decision elements provide a means of overcoming the non-zero failure probability which will always be associated with every component of a digital system. They also permit systems with various amounts of component reliability to meet the same system reliability specifications by using appropriate amounts of redundancy and adaption. A given system reliability may be attained most economically by a redundancy greater than one. The examples calculated for system yield and lifetime show that the factor of increase in system yield or lifetime can be considerably more than the factor by which the redundancy is increased. The examples also indicate the possibility that the factor of increase in reliability of adaptive circuits over unadaptive ones could exceed the cost factor of the adaptive circuits. (Author)

AD-261 123 Div. 30
(10 Aug 61) OTS price $1.60

Kaman Aircraft Corp., Bloomfield, Conn.
DEVELOPMENT AND FABRICATION OF NON-DESTRUCTIVE SPECIFIC GRAVITY MEASURING EQUIPMENT EMPLOYING RADIATION TECHNIQUE.
Monthly progress rept. no. 33, 1-31 May 61. 31 May 61, 4p. (Rept. no. 58-92-PR-33)
(Contract DA 19-059-501-ORD-2631)
Unclassified report

DESCRIPTORS: *Non-destructive testing, Test equipment, Density, Design, Measurement, Radioactivity, *Density sensitive indicators, Radiation instruments, Processing, Radiographic analysis.

Research was continued on the development and fabrication of non-destructive specific gravity equipment employing radiation techniques. The wiring of the density portion of the system was completed. The design of the support structure for the micrometer probe system was completed except for detailing. The conversion of the Olivetti calculator was completed. The control chassis for the calculator and the servo-limit chassis were fabricated. (Author)

AD-261 181 Div. 30, 5, 12
(14 Aug 61) OTS price $1.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
SPECIFICATION FOR WEST FORD POINTING PROGRAM,
by F. E. Heart. 20 July 61, 13p. incl. illus. (Rept. no. 21G-0031; Supersedes 21L-0004, 20-0032)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: *Satellite vehicles, *Radio communication systems, Ground support equipment, *Data processing systems, Orbital flight paths, Mathematical prediction, Scheduling, Mathematical computer data, *Programming, Radar tracking, Digital computers, Antennas.

A system of computer programs was implemented to support the West Ford project. A general diagram of these programs is given. A particular program of that system is described which is called pointing program. The program accepts, as input, the following information (in punched card form): (1) orbit parameters (defined for a particular time period), (2) site selections (one or more of a small number of predetermined ground sites), and (3) schedule selection(s) - (for example, a schedule directing two antennas to a common volume on the belt which gives rise to minimum distance sum). The program computes pointing angles (azimuth and elevation) and predicted range for all the selected sites, for each selected schedule, for approximately a six-hour period at intervals of five seconds or one-half second. The program also computes expected doppler. The data is put in proper format, written on a magnetic tape, and punched on cards. Each schedule for each site appears on a separate set of output cards, in order that the cards may be used to manufacture TTY tape. (Author)

AD-261 266 Div. 30, 9
(24 Aug 61) OTS price $4.60

David Taylor Model Basin. Washington, D. C.
WAKE SIMULATION STUDIES IN THE 12-INCH PROPELLER TUNNEL,
by E. Venning, Jr., and C. E. Shields. July 61, 43p. incl. illus. (Rept. no. 1536)
Unclassified report

DESCRIPTORS: *Wake, Ships, Simulation, *Water tunnels, *Marine propellers, Cavitation, Hydrodynamics, Model tests, Instrumentation.

Experimental studies have been made of the axial wake effects caused by simple objects in the 12-inch propeller tunnel. Specifically, the individual effects of screens of varying mesh, a vertical cylinder, and a vertical flat plate, as well as combinations of these, were studied. A prediction of the axial effect caused by these objects when combined can be made by superposition of their individual effects. (Author)

31. SHIPS AND MARINE EQUIPMENT

AD-261 283 Div. 30, 15
(15 Aug 61) OTS price $1.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
A PROGRAM FOR COMPUTING PROBABILITIES OVER RECTANGULAR REGIONS UNDER THE MULTIVARIATE NORMAL DISTRIBUTION,
by Ann Hillier. 28 July 61, 17p. (Technical rept. no. 54)
(Contract Nonr-22553, Proj. NR 042-002)
Unclassified report

DESCRIPTORS: *Probability, Digital computers, *Programming, *Statistical analysis, Statistical distributions, Matrix algebra, Numerical methods and procedures.

A machine program is given for computing probabilities of multivariate normally distributed random variables beyond the dimension three.

AD-261 412 Div. 30, 6
(16 Aug 61) OTS price $8.10

Scope, Inc., Falls Church, Va.
STUDY OF AUTOMATIC CONDITIONED REFLEX JAMMING MODE SELECTOR.
Quarterly technical note no. 5.
15 Aug 61, 89p. incl. illus. tables.
(Contract AF 33(616)7268, Proj. 0(670)4040)
Unclassified report

DESCRIPTORS: *Radar jamming, *Countermeasures, Automatic, *Memory devices, Digital computers, Signal-to-noise ratio, Correlation techniques, Magnetic cores, Mathematical analysis, Programming, Probability, Ferrite cores, Mathematical logic, Design, Data storage systems, Radar antijamming.

Research was continued on conditioned-reflex action for use in automatic ECM mode selection. The problem of overlap between the inputs on the sensory field is investigated and quantitative measures of signal-to-noise ratio as a function of overlap are derived. Design details of a hardware realization of the model (CONFLEX I) are included. A sequential mode of operation is employed along with memory clipping to make CONFLEX I both highly capable and practical. (Author)

AD-261 488 Div. 30, 8
(18 Aug 61) OTS price $1.60

Stoddart Aircraft Radio Co., Hollywood, Calif.
DEVELOPMENT OF RADIO INTERFERENCE MEASURING TEST SET (10 TO 100 KILOMEGACYCLES).
Quarterly rept. no. 6, 6 Apr-6 July 61,
by B. M. Ward, Jr. 6 July 61, 18p. illus.
(Contract NObsr-81133)
Unclassified report

DESCRIPTORS: Radio interference, *Radio interference analyzers, Measurement, *Test sets, Superhigh frequency, Extremely high frequency, Radiofrequency attenuators, Tuning devices, Design, Tests, Antennas, Power supplies.

Work was continued on the electrical and mechanical design of the Band III (25 to 38 kmc) preselector and attenuators. The mechanical design of the power supply and the electrical design of the metering chassis were completed and the chassis assembled. (Author)

AD-260 814 Div. 31
(9 Aug 61) OTS price $1.60

Coast Guard, Washington, D. C.
FREQUENCY RESPONSE OF ELECTRIC OSCILLATOR FOG SIGNALS.
21 July 61, 19p. incl. illus. (Rept. no. 252)
(Proj. CGTD J15-1/1-11-2)
Unclassified report

DESCRIPTORS: *Fog signals, Tests, Safety devices, Coast Guard research, Oscillators, Naval equipment, Signals, Electronic equipment, Acoustic horns, Frequency.

The frequency response of the following electric oscillator fog signals are reported: U. S. Coast Guard Model 54 Oscillator, 500 watts; French BBT Oscillator, 500 watts; German ELAC Oscillator, Type ELG-300, 1200 watts; and Swedish AGA Oscillator, Type LIEG-300, 1600 watts. Axial sound pressure level as a function of input electrical frequency was determined at constant rated power and at three values of constant applied voltage. (Author)

AD-261 119 Div. 31
(14 Aug 61) OTS price $1.60

David Taylor Model Basin, Washington, D. C.
CAVITATION PERFORMANCE OF A MODEL PROPELLER FOR THE DE1037,
by Curtis E. Shields. May 61, 22p. incl. illus. table (Rept. no. 1512)
Unclassified report

DESCRIPTORS: Destroyer escorts, *Marine propellers, Model tests, *Cavitation, Thrust, Torque, Velocity, Measurement.

Results are presented of cavitation tests performed in the TMB 12-in variable pressure water tunnel on two propellers: TMB propeller 3448 and the model propeller for the DE1037 namely, TMB 3981. The results are presented in the form of open-water characteristic curves, cavitation curves and power loss due to cavitation. In addition, photographs and sketches of cavitation on the propeller blades are shown. (Author)

AD-261 493 Div. 31, 9
(18 Aug 61) OTS price $2.60

David Taylor Model Basin, Washington, D. C.
STATIC TESTS OF A CW-351 SONAR DOME UNDER SIMULATED HYDRODYNAMIC LOADING,
by James A. Nott. July 61, 23p. incl. illus. tables (Rept. no. 1492)
Unclassified report

DESCRIPTORS: *Sonar domes, Hydrodynamics, Structures, Mathematical analysis, Tests, Simulation, Stresses, Load distribution, Test methods, Measurement, Yaw, Ships, Velocity, Pressure.

Structural tests were conducted on a CW-351 sonar dome by simulating the steady-state hydrodynamic forces encountered in a seaway by multiple static loads in the laboratory. Computed steady-state hydrodynamic forces for angles of yaw of 0 deg and 10 deg and for ship speeds up to 35 knots were simulated and applied to the sonar dome. In large areas of the dome, stresses were relatively low. The areas of high stress were at the junc-

ture of the bottom and sides of the dome. Nowhere did the measured stresses exceed the yield strength of the material. The tests indicate that, for domes not subjected to appreciable slamming forces, reinforcement could be more effectively distributed and a lighter dome of adequate strength would still result. (Author)

32. MISCELLANEOUS ARTS AND SCIENCES

AD-260 904 Div. 32
(9 Aug 61) OTS price $8.60

National Research Council, Washington, D. C.
AGRICULTURAL LAND USE OF GUADELOUPE,
by Don R. Hoy. 1961, 97p. incl. illus. tables, 62 refs. (NRC Pub. no. 884; Foreign Field Research Program rept. no. 12)
(Contract Nonr-230009)
Unclassified report

DESCRIPTORS: *Rural areas, *Agriculture, Sociology, Political science, History, *Population, Terrain, Soils, *Economics, Leeward Islands.

This study was designed to describe, analyze, and classify the nature and the extent of agricultural land use on Guadeloupe in order to account for its development and regional distribution. Results of the study have shown how land use has evolved since European colonization, the causes that led to its evolution, and how these causes affect the present land use. Many crops could thrive and give bountiful harvests in one or another of the landtype circumstances that prevail on the islands, but three crops--sugar cane, bananas, and provisions--are currently established in positions of importance. A primary factor in this situation is the impact of pervading influences. These influences indicate that cultural conditions are of first importance in determining the kinds of land use found on Guadeloupe. Regional characteristics have also limited crop choice and are even more important in giving shape to the land use distributional patterns. It appears that the present agricultural land use will not change unless the pervading influences are modified. Minor fluctuations in area devoted to different crops may occur occasionally, but any long-term change is dependent upon changes in the pervading influences. The French Government is attempting to modify some of these influences by improving the educational system, establishing agricultural experiment stations, and exploring the possibilities of other economic activities capable of success. (Author)

AD-261 303 Div. 32
(15 Aug 61) OTS price $1.10

Lincoln Lab., Mass. Inst. of Tech., Lexington.
TECHNICAL INFORMATION FLOW PATTERNS,
by M. M. Kessler. 1961, 11p. incl. illus. tables.
(Sponsored by the Army, Navy, and Air Force)
Unclassified report

DESCRIPTORS: Library science, *Documentation, Technological intelligence, Analysis, Distribution, *Literature, Processing, *Periodicals.

A study of the bibliographies of a large number of articles in physics and electrical engineering indicates that definite patterns exist for the flow of technical information. Quantitative data are presented on the flow of information between countries, between cultural and functional groups, and between past and present. An analysis of the numerical data indicates that these flow patterns are deeply rooted in the dynamics and evolution of scientific thought and engineering development. The analysis also discloses that extreme asymmetry exists between journals in their capacity as carriers of scientific information. (Author)

33. TRANSPORTATION

AD-261 407 Div. 33, 25
(16 Aug 61) OTS price $3.60

Winslow Labs., Rensselaer Polytechnic Inst., Troy, N. Y.
ANALYSIS OF THE DISPLACEMENTS OF THE GROUND SURFACE DUE TO A MOVING VEHICLE,
by Robert L. Schiffman. May 61, 35p. incl. illus. 16 refs. (Rept. no. DA-2910/1)
(Contract DA 30-069-ORD-2910, Proj. 570-05-001)
Unclassified report

DESCRIPTORS: *Soils, Trafficability, Mathematical analysis, Theory, *Deformation, Vehicles, Design, Stresses, Physical properties, Surface properties, Shear stresses, Viscosity, Elasticity.

The problem of the displacement of the ground surface under the action of a moving vehicle is treated from an analytical point of view. The physical mechanisms of soil displacements are presented for the purpose of establishing various models of behavior of the soil system. Visco-elastic models of soil behavior are postulated on the basis of laboratory tests and field observations. A theoretical study is made of the displacements of a loaded plate moving across the soil at relatively slow speeds. This study is based on theories of visco-elasticity. The results of the study are presented in terms of analytical expressions and curves. A physical interpretation of the results is presented, relating vehicular and soil parameters. (Author)

NON-MILITARY AND OLDER MILITARY RESEARCH REPORTS

* Descriptors marked with an asterisk will be included in the cumulative indexes.

ASTRONOMY

Astrophysics

PB 157 235 $5.60

Franklin Inst. Labs. for Research and Development, Philadelphia, Pa.
THE STUDY OF ELECTROMAGNETIC PHENOMENA FOR SPACE NAVIGATION, by R. G. Franklin and D. L. Birx. Quarterly engineering rept. no. 4, 1-Apr-30 June 59, on Contract AF 33(616)5898. [1959] 51p. 12 refs. Rept. Q-A2183-4; AD-225 193.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Space navigation, Gamma rays, Cosmic rays, Extraterrestrial radio waves, *Doppler navigation, *Doppler systems.

From the viewpoint of total energy available, the optical wavelength region appears most suitable for Doppler determination with natural radiation. System studies using available radiation in this range indicate that an 8 or 10 in. telescope appears to be an optimum size. Design parameters for typical Doppler systems are presented, one employing a multiple slit technique to increase the signal level. For the spectra investigated, the optimum number of slits is about 10. Additional studies reported on briefly include an examination of molecular rotation lines predicted in radiation from outer space, molecular amplification at infrared and optical wavelengths and the use of a Fabry-Perot interferometer for Doppler measurement. (Author)

AD-255 279 $3.60

Geo-Science, Inc., Alamogordo, N. Mex.
SOLAR RESEARCH AT SACRAMENTO PEAK OBSERVATORY, by John H. Waddell, III. Final rept. 1 May 57-31 Dec 60, on Contract AF 19(604)2408. Jan 61, 31p. 15 refs. AFCRL-247.

DESCRIPTORS: Solar observatories, *Sun, *Astronomical data, Instrumentation, Photoelectric cells, Photoelectric materials, Sodium.

The program included extensive observations of the sun, electronic research directed toward developing instrumentation for taking highly accurate and reliable solar observations, construction and maintenance of observing systems, reduction of data, and analyses of the data. The results of the analysis of the photoelectric observations of the solar centre-limb variations of the NaD lines are discussed and the report presented at Meudon in September 1960 is included. The study of the temperature distribution in the sun was approached by Waddell with analysis of photoelectric observations of centre-limb variations of moderate strength lines and by Pagel with analysis of continuum observations.

BEHAVIORAL SCIENCES

Human Engineering

PB 157 244 $3.60

Air Force Flight Test Center, Edwards AFB, Calif.
THE FREQUENCY RESPONSE AND THE TRANSFER FUNCTIONS OF THE HUMAN PILOT, by G. M. Andrew. Mar 53, 34p. 11 refs. AF Technical rept. no. AFFTC 52-28; AD-7678.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Pilots, Flight tests, Reaction time, Statistical anaylsis, Control systems, Servomechanisms, Human engineering, Aircraft.

A method is presented for obtaining from flight tests the frequency response and transfer functions of the pilot. Frequency response is computed from oscillographic records of the time history of a pilot's reaction. Several flying techniques suggested would yield the transfer functions. This information should be useful in determining basic design criteria for control systems as well as determining which type of aircraft is best suited to a particular pilot.

PB 157 288 $1.60

Psychological Lab., Johns Hopkins U., Baltimore, Md.
[PSYCHOPHYSIOLOGICAL ASPECTS OF SENSORY PERCEPTION AND DISCRIMINATION RELATING TO DESIGN CHARACTERISTICS, HUMAN UTILIZATION AND EVALUATION OF MAN-MACHINE SYSTEMS]. Progress rept. no. 2 [on Contract Nonr-248(55)]. 1 Nov 59, 18p. AD-228 930.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Sensory perception, Reasoning, *Human engineering, Bibliography, Cybernetics.

BIOLOGICAL SCIENCES

PB 157 237 $6.60

Biophysics Lab., Tulane U., New Orleans, La.
DIRECT CURRENT POTENTIALS OF THE CENTRAL NERVOUS SYSTEM. A REVIEW, by Lawrence R. Pinneo. Technical rept. on Contract AF 30(602)1965. June 59, 63p. 185 refs. RADC-TN-59-137; AD-214 692.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Brain, Electrical properties, Measurement, *Electric potential, Electroencephalography, Direct current.

The normal brain of the mammal is electrically polarized. Two forms of this steady potential are evident: a resting potential present in the absence of stimuli, and

a second potential that is apparently due to incoming sensory volleys. The importance of these potentials is emphasized by the d-c shifts associated with external and locally applied stimulation; these shifts are also intrinsically linked with such phenomena as paroxysmal seizures, spreading depression, and cortical-reticular formation arousal. This report reviews the evidence of direct current potentials in the central nervous system and attempts an assessment of their theoretical value. (Author)

TID-13059 $1.10

Iowa State U., Iowa City.
THE CHEMISTRY OF BORON IN PLANTS, by S. Aronoff. Rept. on Contract AT(11-1)-59. 1 June 61, 7p.

PB 157 684 $8.60

Stanford U., Calif.
THE METABOLIC ACTIVITY OF THE CENTRAL NERVOUS SYSTEM AS IT AFFECTS THE THERMOSTATIC BEHAVIOR OF THE BODY, by Victor E. Hall. Final rept. App. 1 for 1 July 46-30 June 48 on Contract W33-038-ac-14986. 4 Nov 48, 97p. 12 refs. Serial no. MCREXD-696-113D; ATI-50 255.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Brain, *Metabolism, *Hypothalamns, *Tissues (Biology), *Body temperature, Temperature, Typhoid vaccine, Liver.

The metabolic activity of the central nervous system as it affects the thermostatic behavoir of the body was studied. The theoretical aspects are considered and studies were conducted on the mechanism of action of pyrogens, and the effects of various substances on the thermostatic behavior of the intact animal and on brain metabolism are compared. The genesis of thermal polypnoea, emotional disturbance of temperature regulation in rabbits is discussed, and an equation is given for the temperature coefficient of oxygen consumption of hypothalamic tissue. Studies were also made on brain metabolism at supranormal temperatures, and the effect of environmental temperature on the response to paratyphoid vaccine in rabbits, and metabolism of liver tissue in fever.

Pharmacology and Toxicology

PB 157 677 $1.60

[Aerospace Medical Div.] Wright Air Development [Div.] Wright-Patterson AFB, Ohio.
TRANQUILIZING DRUGS AND STRESS TOLERANCE, by Terence F. McGuire and Frank J. Leary. Rept. on High Altitude Physiology. Oct 58, 11p. 19 refs. WADC Technical rept. 58-64; AD-205 542.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Tranquilizing drugs, Therapy, Stress (Psychology), Pilots, Physiology, High altitude, Pharmacology, Drugs

Stress tolerance studies were performed on a group of ten healthy male subjects, ranging in age from 18 to 27, both in their normal state and while on therapeutic doses of the tranquilizers, promazine hydrochloride (Sparine) or meprobamate (Miltown, Equanil). Stress tolerance was reduced while on tranquilizers. The limitation was more severe with the promazine hydrochloride than with the meprobamate. However, as the degree of stress increased, the limitation of response became marked with both groups of tranquilizing agents. Experiments with very high doses yielded even more severe limitations. Psychological factors are also discussed. These studies demonstrate that, when the clinical situation demands tranquilizers, the airman should be removed from flying status while on the drug.

UR-549 $4.60

Rochester U. Atomic Energy Project, N. Y.
THE CELL MEMBRANE AS THE SITE OF ACTION OF HEAVY METALS. DISCUSSION: THE INTERACTION OF METALS WITH EPITHELIA, by Aser Rothstein and T. W. Clarkson. Rept. on Contract W-7401-eng-49. 28 April 61, 47p.

UR-590 $2.60

Rochester U. Atomic Energy Project, N. Y.
THE INHALATION TOXICITY OF INDIUM SESQUIOXIDE IN THE RAT, by L. J. Leach, J. K. Scott, and others. Rept. on Contract W-7401-eng-49. 10 May 61, 30p.

PB 157 258 $1.60

School of Aviation Medicine [Brooks AFB, Tex.]
THE USE OF DRUGS IN AVIATION MEDICINE, by Fred W. Oberst and Helen M. Ely. Special rept. June 50, 14p. 22 refs. AD-138 723.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Drugs, *Aviation medicine, High altitude, Physiology, Oxygen consumption, Metabolism, Reaction time.

The reaction produced by some drugs is no different at altitude than at ground levels, but those effects might be undesirable in individuals taken to altitude where precise judgment and coordination is essential for operation of a complicated task. The use of some drugs is contraindicated at altitude because they lower the oxygen-carrying capacity of the blood. Others are metabolized or utilized by the body in a modified manner when the oxygen tension is decreased as at altitude. Under such conditions the dosage must be adjusted accordingly, either by an increase or a decrease, depending on the modified effect. Consequently, when a new drug is introduced and is to be used at altitude its possible side effects must always be considered and possibly be determined in order to prevent adding to the stress already imposed on the body by altitude effects.

Radiobiology

TID-12877 $1.60

John Collins Warren Labs., Huntington Memorial Hospital, Harvard U., Boston, Mass.
A STUDY OF THE MECHANISMS OF PROTEIN AND NUCLEIC ACID METABOLISM AND THEIR RELATIONSHIP TO RADIATION DAMAGE, by Paul

Zamecnik, Joseph W. Gardella, and others. Progress rept. on Contract AT(30-1)-2643. 1 June 60-31 May 61. 17p.

TID-12876 $3.60

New England Deaconess Hospital, Boston, Mass. PROGRESS REPORT XXI on Contract AT(30-1)901 for 1 November 60-30 April 61. 39p.

CHEMISTRY

Organic Chemistry

PB 157 253 $1.60

Institute of Organic Chemistry, U. of Chicago, Ill. STRUCTURE OF PEROXIDES DERIVED FROM CYCLOHEXANONE AND HYDROGEN PEROXIDE, by M. S. Karasch and George Sosnovsky. Rept. on Contract N6ori-02040. [1957] 19p. 21 refs. AD-202 376.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Cyclohexanones, *Hydrogen compounds, *Peroxides, Chemical reactions.

Cyclohexanone and aqueous hydrogen peroxide react in the absence of a mineral acid catalyst to form 1, 1'-dihydroxydicyclohexyl peroxide (I). In the presence of traces of mineral acids, however, the only product is 1-hydroxy-1'-hydroperoxydicyclohexyl peroxide (V). Since I can be converted to V by the action of hydrogen peroxide and traces of mineral acids, I appears to be an intermediate in the formation of V. That 1-hydroxy-1-hydroperoxy cyclohexane (II) is also an intermediate in these reactions is suggested by the fact that the 2-chloro and 2-bromo analogues of II certainly are products of the reactions between hydrogen peroxide with the corresponding 2-halocyclohexanones. The decompositions of I and V by ferrous ion have been reinvestigated. Several related peroxides have been prepared, and their infrared spectra recorded.

NYO-2712 $10.10

Pennsylvania State U., University Park. AN INVESTIGATION OF THE CHEMICAL NATURE OF THE ORGANIC MATTER OF URANIFEROUS SHALES, by C. R. Kinney and L. J. Duffy. Annual rept. on Contract AT (30-1)1442. 21 Apr 61, 129p.

Physical Chemistry

PB 157 585 $1.60

Calvin Coll., Grand Rapids, Mich. THE STANDARD POTENTIAL OF THE Ag/Ag_2O ELECTRODE IN ALKALINE SOLUTIONS, by Thedford P. Dirkse. Technical rept. no. 11, Contract Nonr-1682(01). 30 Sep 60, 12p. 8 refs. AD-248 618.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Electrolysis, *Electrodes, Electric potential, Hydroxides, Oxides, Potassium compounds, Silver compounds, Silver.

The standard potential of the Ag/Ag_2O electrode in alkaline solutions was determined by measuring the emf of the cell Pt, $H_2(g)$ KOH aq $Ag_2O(s)$, Ag(s). At 25 degrees C the oxidation potential for this electrode is -0.3384 + or - 0.0010 volt. (Author)

PB 157 287 $4.60

Cornell U., Ithaca, N. Y. ULTRA-HIGH VACUUM METAL PHYSICS MEASUREMENT OF LOW PRESSURES OF OXYGEN, by Lee H. Rovner. Technical rept. no. 3 on Contract Nonr-401(31) 1 Oct 60, 42p. 18 refs. AD-246 401.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: Physical properties, *Metals, Surface properties, Oxygen, *Vacuum apparatus, Measurement, Ionization gages; Gases, *Low pressure research, Instrumentation.

Investigations of physical properties of metal surfaces in high vacuum can be seriously complicated by gas-metal reactions with residual gases such as oxygen. These effects are particularly characteristic of pressure measuring devices requiring hot filaments for their operation. A cold cathode ionization gauge of Redhead's design was investigated, and its usefulness in measuring low oxygen pressures was evaluated in terms of a hot filament Bayard-Alpert gauge. The pumping speed and other high vacuum operating characteristics of a reduced-size cold cathode gauge were also compared with those of a conventional cold cathode gauge. The pumping speed of both gauges was high and showed considerable dependence on the pretreatment of the gauges. An omegatron mass spectrometer gauge was also used to investigate the interactions of oxygen at low pressures with hot filaments. The dependence of the production of CO and CO_2 on filament composition and temperature was specifically studied. Production of CO was promoted by carbon contained in the filaments, by high filament temperatures, and by the accelerating potentials used in operating hot filament gauges. Precautions peculiar to each type of gauge must be exercised for their effective application to the monitoring of gas-metal reactions in oxygen at low pressures. (Author)

TID-12563 $1.60

Los Alamos Scientific Lab., U. of California, N. Mex. SHOCK INITIATION OF EXPLOSIVES III. LIQUID EXPLOSIVES, by J. R. Travis, A. W. Campbell, and others. [1961] 19p.

PB 154 788 $1.10

New York State U. SOLUTION PROPERTIES OF CELLULOSE DERIVATIVES, by H. J. Marrinan, R. Cummings and J. J. Hermans. Final rept. 1 Jan 59-15 Aug 60, on Contract DA 30-069-ORD-2484. [1960] 10p. 8 refs. AROD rept. 2237:2-C.

DESCRIPTORS: *Cellulose chemistry, *Solutions, *Cellulose nitrates.

PB 152 078 $2.60

New York U., N. Y.
TRANSFERENCE PHENOMENA IN MOLTEN SALTS, by Benson R. Sundheim. Technical progress rept. on Contract Nonr-285-37. 1 Sep 60, 22p. 17 refs. AD-243 705.

DESCRIPTORS: *Salts, *Electrolysis, *Electrochemistry, Physical chemistry.

The values that were reported for the transference numbers in molten salts measured in Hittorf type experiments reveal that the center of gravity of a molten salt contained in an electrolysis cell moves with the passage of electricity in a fashion analogous to electroosmosis. It is shown that the interpretation of such movement requires extension of the conventional hydrodynamic equations of motion by the addition of terms representing the viscous resistance of each species to maintaining a state of shear. The partial viscosities which are thus introduced are used to express the difference between the transference numbers measured in the reference frame of the cell and those in the reference frame of the local center of gravity. It was found that the latter may be expressed in terms of friction coefficients alone, whereas the former required the use of partial viscosities as well. In addition to a discussion of the significance of the results to transference number measurements, applications to conductance in narrow tubes and electrokinetic mobility are presented. (Author)

TID-13054 $2.60

Notre Dame U., Ind.
FIELD DEPENDENCE OF PHOTOELECTRIC EMISSION FROM MOLYBDENUM, by R. C. Jaklevid and D. W. Juenker. Rept. on Contract AT (11-1)-274. [1961] 24p.

PB 157 662 $3.60

Occidental Coll., Los Angeles, Calif.
INVESTIGATION OF THE NATURE OF THE FORCES OF ADHESION, by L. Reed Brantley and Arthur E. Woodward. Technical rept. for 1 July 49-30 June 50, on Contract N9onr-86701. 30 June 50, 33p. 3 refs. ATI-107 754.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Adhesion, Theory, Metals, Organic coatings, Varnishes.

The effect of a liquid interface between an organic coating and a metal upon adhesion was investigated. The adhesion to aluminum of a set of nitrocellulose lacquers and a set of ethylcellulose lacquers with increasing quantities of dibutyl phthalate as plasticizer was tested. Maximum adhesion was shown at about 15% plasticizer content for the nitrocellulose series and at 10% plasticizer content for the ethylcellulose series. The increase in adhesion was attributed to an increased mobility or ability to orient of the polymer groups caused by the presence of a liquid at the interface between the lacquer and the metal. The effect of the difference in coefficients of expansion between a non-plasticized ethylcellulose film and five different metals (aluminum 24ST3, brass, copper, and stainless steels 430 and 302) on the adhesion of the coating to the metals was investigated. The loss in adhesion of panels heat dried, and those heated or cooled after drying as compared with untreated air dried panels increased with increasing difference in coefficient of expansion and was greatest for the heat dried lacquer coatings. The adhesion and plasticity reached a constant value after 7 to 11 days. With an unplasticized ethylcellulose lacquer, constant adhesion and plasticity were reached after 4 days. It was concluded that solvent evaporation was still occuring until the plasticity reached a constant value. (See also 157 663)

PB 157 663 $3.60

Occidental Coll., Los Angeles, Calif.
THE INVESTIGATION OF THE NATURE OF THE FORCES OF ADHESION, by L. Reed Brantley and William H. Jones. Technical rept. for 1 July 51-30 June 52 on Contract N9onr-86701. [1952] 31p. AD-15 644.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Adhesion, Theory, Metals, Organic coatings, Varnishes.

The effects of plasticizer and resin additions on the Adherometer adhesion of simple nitrocellulose lacquers has been investigated. The effect of the testing temperature and of humidity variations on the measurement of Adherometer adhesion were investigated. A maximum Adherometer adhesion was found for R. S. 1/2 sec. nitrocellulose at ten per cent plasticizer when using tricresyl phosphate plasticizer. An increase in Adherometer adhesion was found with increasing resin content at constant per cent plasticizer. However, the Adherometer adhesion decreased with increasing plasticizer content up to 7.6% tricresyl phosphate for a resin to polymer ratio of one. No essential difference in the values for the Adherometer adhesion of a nitrocellulose lacquer was obtained when they were dried at different temperatures and immediately tested at the temperature of drying. Experimental procedures involving dipping time and the mechanical elimination of tear resistance have an effect on the slopes of stripping force curves plotted against film thickness but have little, if any, effect upon the Adherometer adhesion. (Author) (See also Techincal Translations, 59-18522, 59-20133, 60-10058, 61-15376)

PB 157 243 $4.60

Ohio State U. Research Foundation, Columbus, Ohio.
A MASS SPECTROMETRIC DETERMINATION OF THE HEATS OF SUBLIMATION (OR VAPORIZATION) OF NEODYMIUM, PRASEODYMIUM, GADOLINIUM, TERBIUM, DYSPROSIUM, HOLMIUM, ERBIUM AND LUTETIUM, by David White, Patrick N. Walsh and others. Technical rept. no. 5 on Contract Nonr-495(12). Aug 60, 41p. 15 refs. RF proj. 691; AD-242 345.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Rare earth elements, *Heat of sublimation, Neodymium, Praseodymium, Gadolinium, Terbium, Dysprosium, Holmium, Erbium, Lutecium, Thermochemistry, *Mass spectroscopy, Vaporization.

The heats of sublimation or vaporization were determined from measurements of the variation of intensity

of the metal ion with temperature at a fixed ionizing electron current and energy. The heats of sublimation or vaporization and the standard deviations were determined from a least square treatment of the data. There are a few major discrepancies between the results of this research and those of previous investigations. The heats of sublimation of lutecium and terbium are higher than those previously reported, 94.7 vs 90 kcal/mole for lutecium and 87.5 vs 70 kcal/mole for terbium; the heat of sublimation of dysprosium is lower, 61.6 vs 67 kcal/mole. Such discrepancies were suggested in the vaporization of the sesquioxides. The application of the Bendix Time-of-Flight spectrometer to the study of high temperature equilibria was satisfactory.

PB 157 283 $21.00

Pennsylvania U., Philadelphia.
THE ELECTRICAL CONDUCTANCE AND STRUCTURE OF SIMPLE MOLTEN ELECTROLYTES, by E. H. Crook and J. O'M. Brockris. Final technical rept. 16 Oct 55-15 Oct 58, on The Properties and Constitution of Liquid Electrolytes, Contract DA 36-034-ORD-1765. [1958] 352p. 239 refs. AD-215 096.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: Liquids, Theory, Conductivity, *Electrolytes, Electrical properties.

The specific and equivalent conductivities of group IIA and IIB alkaline earth halides were determined as a function of temperature between 230° and 1100°C. These data and the conductivities for group IA alkali halides, as obtained from literature, were correlated with other physical parameters to study the structure of the molten state of these different halides. The theory of conductance processes in molten salts is related to a hole model and to a cell model. The applicability of the Stokes-Einstein and Nernst-Einstein equations to molten salts is discussed. Previous evidence is given for the likely structural models for the different halide groups.

PB 157 586 $3.60

Research and Advanced Development Div., Avco Corp., Wilmington, Mass.
EXPLORATORY RESEARCH ON THE VAPORIZATION OF SOLIDS, by Charles H. Leigh. Annual progress rept. no. 1 on Contract Nonr-3051(00). 31 Dec 60, 31p. 2 refs. Rept. RAD-SR-18-60-120; AD-249 086.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Solids; *Vaporization; *Plasma physics; Plasma jets; *Refractory materials; Molecular beams; Mass spectrometers; Design; *High temperature research.

Exploratory research on the use of the plasma generator is being conducted for an investigation of the effects of very high temperatures on solids. It is intended to study the processes of vaporization of simple refractory compounds and to determine the pressure and composition of the gaseous phase. A time-of-flight mass spectrometer was constructed for the specific problem with which this contract is concerned. This spectrometer was designed to permit the attachment of a high-temperature molecular beam probe directly below the ionization region. Studies were made on the design and construction of a high-temperature molecular beam probe. In the course of these studies, two such high-temperature probes were designed and built. The second probe is a completely new design based upon the experience gained with the first probe design. Initial tests made with the second probe have shown that the design appears to be promising. A description of the experimental arrangement is given, with details of existing equipment. In addition to the construction of the mass spectrometer system and the two probes, the small plasma generator was constructed. This plasma generator operates with an inert gas stabilization, such as argon, and at a power level of approximately 6 kw. This generator is capable of attaining temperatures in excess of 3600 deg C. (Author)

PB 157 259 $2.60

[Research Inst.] U. of Michigan, Ann Arbor.
A METHOD FOR CALCULATING THE RATE OF EVAPORATION AND THE CHANGE IN DROP SIZE DISTRIBUTION FOR PURE SPRAYS INJECTED INTO UNSATURATED AIR, by Myron Tribus, John Klein and John Rembowski. Rept. on Contract AF 18(600)61. May 52, 26p. 4 refs. ATI-168 524.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Evaporation, *Drops, *Sprays, Ice, Liquids.

The equations for the evaporation of a single water drop, a spray of uniform drops, and a spray of nonuniform drops are presented and solved. It is shown that when wet-bulb depression is used as a parameter, considerable simplification occurs and the solutions may be obtained in closed form for the first two cases and may be found rapidly by a graphical method for the third. It is also shown that, given an initial drop-size spectrum, the successive spectra may be deduced almost immediately, without reference to the evaporation equations. Sample calculations are given for water sprays. Limitations and extensions of the analyses are discussed. (Author)

SCTM-279-60(72) $2.60

Sandia Corp., Albuquerque, N. Mex.
A PRECISION, CONTINUOUS FLOW ENVIRONMENTAL APPARATUS DESIGNED FOR THE TESTING AND CALIBRATION OF HUMIDITY-MEASURING ELEMENTS, by James E. Wade. Jan 61, 26p.

SCR-418 $1.60

Sandia Corp., Albuquerque, N. M.
STATUS OF SANDIA'S PLASMAJET LABORATORY, by K. L. Shipley. July 61, 19p.

PB 154 258 $3.60

Technical U., Copenhagen (Denmark).
ANODIC DISSOLUTION OF IRON. I. GENERAL MECHANISM, by K. A. Christiansen, H. Høeg and others. [1960] 36p. 17 refs.

DESCRIPTORS: *Iron, *Electrolysis

The kinetics of the anodic dissolution of iron is essentially governed by a mechanism in which the pH dependent and potential dependent dissociation of chemisorbed water plays a dominating role. A system of differential equations is derived and solved for steady state conditions. An interesting consequence is that the mechanism of passivity is the electrostatic repulsion of hydrogen ions, necessary for the dissolution of surface oxide layers. The influence of oxygen, dissolved in the aquous phase, and of hydrogen, dissolved in the metal phase, are discussed.

PB 155 597 $3.60

Transitron Electronic Corp., Wakefield, Mass.
THERMOELECTRIC MATERIALS. Quarterly progress rept. no. 6,4 Dec 60-3 Mar 61, on Contract NObs-78345. [1961] 34p. 1 ref.

DESCRIPTORS: *Thermoelectricity, *Heat resistant alloys, *Silicides, Manganese alloys, Silicon alloys.

Experimental results are reported on the investigation of the $Cr_{1-x}M_x Si_{2.00}$ and $Mn_{1-x} M_x Si_{2.00}$ series of compounds prepared by the argon arc technique. The trends in the thermoelectric power parameters are found to deviate from those predicted on the hypothesis developed previously. Alloys are being prepared by induction heating followed by a carefully controlled slow cool. Materials prepared in this way show improved properties. The optimization of the thermoelectric properties of the compounds $MnSi_2$ and $Mn_{1-x}M_xSi_{200}$ has been attempted by making Ag, Au and Sn additions. The properties are improved. Metallographic evidence of the non-equilibrium state of $MnSi_2$ alloys, containing excess Mn, Ag and Au has been obtained. The properties of the material in the equilibrium state are not as yet determined. Work has been continued on discrete particle systems, and experiments have been carried out to ensure that in the system selected, surface effects are minimized. The apparent Seebeck coefficient is found to be particle size dependent as a result of heat flow characteristics.

PB 157 680 $8.60

Utah U., Salt Lake City.
PHYSICAL CHEMISTRY OF GALLIUM-INDIUM ALLOYS, by J. Hugh Hamilton, John R. Lewis, and J. P. Denny. Final technical rept. on Contract N7onr-451(02). 15 May 50, 93p. 40 refs. ATI-86 802.

This report released for sale to the public 8 Sep 61

DESCRIPTORS: *Gallium alloys, *Indium alloys, *Physical chemistry, Corrosion, Alloys.

Alloys of gallium, indium, tin, lead, and bismuth were studied in the development of gallium-base alloys which are liquid at room temperature. The gallium-indium eutectic, located at 24% indium, melts at 15.7°C, and the gallium-indium-tin eutectic, determined as having the composition 62.5% Ga, 21.5% In, and 16% Sn, melts at 10.7°C. Techniques were developed for metallographic examination of the low melting gallium alloys, and very striking strain lines have been observed in some of the structures. Corrosion tests were conducted on these same alloys under oxidizing conditions, to determine alloy stability. Experimental evidence failed to show any gallium-lead-bismuth composition that is liquid at room temperature.

PB 152 044 $3.60

Washington U., Seattle.
THE VAPOUR PRESSURES OF SOME HEAVY TRANSITION METAL HEXAFLUORIDES [AND] VAPOUR PRESSURES OF SOME FLUORIDES AND OXYFLUORIDES OF MOLYBDENUM, TUNGSTEN, RHENIUM AND OSMIUM, by George B. Hargreaves and George H. Cady. Technical rept. nos. 28 and 29 on Contract Nonr-477(16). 1960, 37p. 32 refs. AD-243 296.

DESCRIPTORS: *Vapor pressure, *Fluorides, *Tungsten compounds, Molybdenum compounds, Rhenium compounds, Osmium compounds, Iridium compounds, Oxyfluorides, Physical properties, Nuclear magnetic resonance, Transition temperature, Disproportionation.

Report 28: The vapor pressures of WF_6, MoF_6, ReF_6, OsF_6, and IrF_6 were measured by a static method using a highly sensitive diaphragm gage. Solid-solid transitions are reported for ReF_6 at -1.9°C, OsF_6 at -0.4°C, IrF_6 at 0.4°C, WF_6 at -8.2°C, and MoF_6 at -8.7°C. More accurate physical constants were calculated from the vapor pressure data. Nuclear magnetic resonance studies with both solid and liquid hexafluorides suggested that there is molecular rotation in the solid state above the transition point. Observations with the spectra of WF_6 and MoF_6 showed that a sharp fluorine resonance was obtained with the solid compounds, provided the temperature was above the transition point. Below the transition point the sharp peak broadened out completely, suggesting the cessation of molecular rotation. Report 29: The vapor pressures of ReF_5, MoF_5, OsF_5, $ReOF_4$, $MoOF_4$, WOF_4, $ReOF_5$, and ReO_2F_3 were measured by a static method using a highly sensitive diaphragm gage. Other physical constants were derived from the vapor pressure data. The compound $ReOF_5$ was studied in detail and a solid-solid transition at 30.0°C was reported. The thermal disproportionation of ReF_5, MoF_5, and OsF_5 was investigated. At 130°C, ReF_5 underwent irreversible disproportionation to yield ReF_6 and nonvolatile ReF_4. Molybdenum pentafluoride began to disproportionate at 165°C and OsF_5 at 180°C.

EARTH SCIENCES

PB 155 794 $5.60

Graz U. (Austria).
A THEORETICAL STUDY OF VARIOUS IONOSPHERIC MODELS, by Otto Burkard. Final rept. 1 Mar 60-28 Feb 61, on Contract DA 91-591-EUC-1378. 20 Mar 61, 51p. 25 refs.

DESCRIPTORS: *Ionosphere models, Theory, Temperature, Electrons.

The model presented in this study is mainly based on N(h) profiles, but agreement is also excellent with observations obtained by the moon echo method, moreover, with determinations of density derived from satellite orbits. In this connection valuable information is

obtained from H(h) profiles which were computed for many cases and which show the diurnal variation of the scale height. Additional calculations were performed in order to determine the seasonal variation of the scale height at least basically. (Author)

PB 156 589 $1.10

Navy Hydrographic Office, Washington, D. C.
OPERATION DEEP FREEZE 61 MARINE GEOPHYSICS OBSERVATIONS. Preliminary rept. 6 June 61, 7p. Serial 3962.

DESCRIPTORS: Oceanography, *Geophysics, Terrestrial magnetism, *Marine meteorology, Antarctic regions

Climatology and Meteorology

PB 153 901 $1.10

Massachusetts Inst. of Tech. [Cambridge].
DEVELOPMENT OF METHODS FOR THE CALCULATION OF RADIATIVE TEMPERATURE CHANGES IN THE ATMOSPHERE, by Lewis D. Kaplan. Final rept. 1 Sep 57-31 Aug 60, on Contract Nonr-1841(45). [1960] 5p. 5 refs.

DESCRIPTORS: *Atmosphere, Heat transfer, Temperature, *Infrared radiation, *Thermal radiation.

PB 156 397 $8.60

Naval Ordnance Lab., White Oak, Md.
REPORT ON PHASE I OF THE FEASIBILITY COMMITTEE FOR 200,000 FOOT ALTITUDE INSTRUMENTED HASP, by S. J. Raff, M. J. Parker and others. 15 Dec 59, 96p. 26 refs. NAVORD rept. 6763.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Meteorological instruments, *Stratosphere, Thermistors, *High altitude, *Sounding rockets, Upper atmosphere, Telemeter systems.

There is very little atmospheric information available above 100,000 feet, and the requirements of military and other programs which will use such information are not defined in such a way as to justify firm accuracy goals. It is recommended that a transponding sonde (x-band of 403 megacycle) be developed and that the final selection of sensors for a mass produced sonde be preceded by flight tests to evaluate the most promising sensors. For initial flights the committee recommends a bead thermistor, for temperature sensing and a single point pressure indicator to operate at 50,000 to 80,000 feet. A number of suggestions are made for other types of temperature and pressure sensors which might be developed for later models.

PB 154 238 $1.10

Weather Bureau, Washington, D. C.
QUARTERLY REPORT NO. 3, MAY 1-JULY 31, 1960, by H. E. Landsberg. Rept. on DA Proj. no. 3-99-00-500; MIPR no. R-65-8-99831SC-03-91. 4p.

DESCRIPTORS: *Meteorological data, *Greenland, Pressure, Temperature, Arctic regions, Wind, Surface temperatures, Marine meteorology.

Contents:
Circulation studies based on observed winds
Re-analysis of Thule radio-sonde flights
Correlation of pressure changes aloft and at the surface
Upper air temperature regime in the Greenland area
The problem of disturbances crossing the ice cap
The influence of open water
The interdiurnal changes of the heights and temperatures of standard isobaric levels.

Seismology

WT-1741 $2.00

Coast and Geodetic Survey, Washington, D. C.
SURFACE MOTIONS FROM UNDERGROUND EXPLOSIONS. APPENDIX A. RESPONSE SPECTRUM ANALYSIS OF RECORDS FROM EVENTS BLANCA AND LOGAN, by D. S. Carder, William K. Cloud and others. Final rept. on Operation Hardtack, Phase II, Contract AT(29-2)-746. Mar 61, 81p.

UCRL-13012 $7.60

Colorado School of Mines Research Foundation, Inc., Golden
SOURCES OF INFORMATION ON ROCK PHYSICS, CURRENT LITERATURE, June 1961, by Lorraine Burgin. 30 June 61, 71p.

WT-1529 $1.75

Sandia Corp., Albuquerque, N. Mex.
SUBSURFACE MOTION FROM A CONFINED UNDERGROUND DETONATION PART I, by William R. Perret. Rept. on Operation Plumbbob. 1 Aug 61, 72p.

ENGINEERING

TID-13024 $2.60

Universal Match Corp., St. Louis, Mo.
INVESTIGATION OF THE EFFECTS OF IONIZING RADIATION ON THE SEDIMENTATION OF SEWAGE. Quarterly rept. no. 2 on Contract AT(11-1)-905. 1 June 61, 28p.

Aeronautical Engineering

PB 157 234 $2.60

Air Force Flight Test Center [Edwards AFB, Calif.]
EXTRACTION SYSTEM FOR A-22 CONTAINERS, by Gary D. Miller. Nov 58, 24p. AFFTC-TN-58-30; AD-205 482.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Containers, *Air drop operations, Parachutes, Tests, Parachute descents, Transport planes.

The purpose of this test program was to determine the feasibility of an extraction system for A-22 containers. Drop tests were conducted utilizing single row, double row and single A-22 container loads at airspeeds of from 115 to 150 kn at 1500 ft. These containers could be satisfactorily extracted at speeds up to 130 kn.

PB 157 232 $10.10

Air Force Flight Test Center [Edwards AFB, Calif.]
HIGH ALTITUDE AND HIGH AIRSPEED TESTS OF STANDARD PARACHUTE CANOPIES, by Harry F. Freeman and I. Rosenberg. Oct 58, 122p. 2 refs. AFFTC-TR-58-32; AD-152 286.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Parachutes, High altitude, Tests, *Parachute descents.

Tests of five personnel parachute designs were made at three altitudes and at various airspeeds. Opening forces and times were measured. The effect of altitude, airspeed and parachute design on opening characteristics is reported.

PB 157 252 $8.10

Polytechnic Inst. of Brooklyn, N. Y.
ON THEORIES OF THE DUCT SHAPE FOR A DUCTED PROPELLER, by L. Meyerhoff and A. B. Finkelstein. Rept. on Contract Nonr-839(07). Aug 58, 90p. 19 refs. PIBAL rept. no. 484; AD-220 741.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Propeller shrouds, *Shrouded propellers, Ducts.

Analytical methods are reviewed for calculating the shape of a duct enclosing an operating propeller. One method is the classical technique of superposing singularity distributions to simulate the component parts of the system. This mathematical technique determines the flow field from the interaction between singularities such as vortex sheets, sink disks and source rings. Derivations are given of the singularities occurring for the ducted propeller. Relations between different mathematical representations for a singularity distribution are shown; connections are also shown between different singularity distributions. The problem of velocity distribution at the propeller is described and an extension is given for obtaining radially uniform inflow. A second method is based on the solution of a boundary value problem. Stream functions and corresponding streamlines are determined, from which the duct shape is developed. Uniform flow at the propeller generally is one of the prescribed boundary conditions. Computations appear to be simpler with the boundary value approach. (Author)

PB 157 254 $1.10

Wichita U., Kansas.
SHROUDED PROPELLER INVESTIGATIONS AT THE UNIVERSITY OF WICHITA, by Robert K. Wattson, Jr. Summary rept. on Contract Nonr-201(01). Mar 58, 9p. Engineering rept. no. 306; AD-209 619.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Shrouded propellers, Tests.

This booklet summarizes the comprehensive program of experimental and theoretical investigation of shrouded propellers for aircraft propulsion being conducted. Past, current and future programs are included. Since the purpose of this booklet is simply to acquaint the reader with the scope of the investigations, no results or data are given. (Author)

PB 157 282-5 $5.60

Wichita U., Kansas.
SHROUDED PROPELLER INVESTIGATIONS: WIND TUNNEL TESTS OF A SHROUDED PROPELLER WITH A 10-BLADED PROPELLER, EXIT STATORS, AND LONG CHORD SHROUD WITH HIGH SPEED INLET AND NO EXIT DIFFUSION, by Vernon O. Hoehne. Rept. on Contract Nonr-201(01). Jan 59, 55p. 7 refs. Engineering rept. no. 213-5. AD-210 032.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Shrouded propellers, Tests.

A shrouded propeller unit having 10 variable pitch propeller blades and 15 exit vanes was tested in the Walter H. Beech Memorial Wind Tunnel. The model embodied a 0.684 chord/diameter ratio shroud having a high speed inlet and a non-diffused exit. Performance parameters were determined throughout a range of angle of attack from zero to 30° and advance ratios from zero to approximately 5.0 at various propeller blade pitch settings. Results are presented in the form of force, moment and power coefficients, and propulsive efficiencies varying with advance ratio and propeller blade pitch angle.

PB 157 282-6 $7.60

Wichita U., Kansas.
SHROUDED PROPELLER INVESTIGATIONS: WIND TUNNEL TESTS OF A SHROUDED PROPELLER WITH A 10-BLADED PROPELLER, EXIT STATORS, AND LONG CHORD SHROUD WITH STATIC INLET AND NO DIFFUSION, by Vernon O. Hoehne. Rept. on Contract Nonr-201(01). Jan 59, 71p. 6 refs. Engineering rept. no. 213-6; AD-210 033.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Shrouded propellers, Tests.

A shrouded propeller unit having 10 variable pitch propeller blades and 15 exit vanes was tested in the Walter H. Beech Memorial Wind Tunnel. The model embodied a 0.772 chord/diameter ratio shroud having inlet designed for static and low-speed operation and a non-diffused exit. Performance parameters were determined throughout a range of angle of attack from zero to 90° and advance ratios from zero to approximately 4.0 at various propeller blade pitch settings. Results are presented in the form of force, moment and power coefficients, and propulsive efficiencies varying with advance ratio and propeller blade pitch angle. (See also PB 157 282-5)

PB 157 282-7 $7.60

Wichita U., Kansas.
SHROUDED PROPELLER INVESTIGATIONS: WIND TUNNEL TESTS OF A SHROUDED PROPELLER WITH A 10-BLADED PROPELLER, EXIT STATORS, AND LONG CHORD SHROUD WITH A MODIFIED STATIC INLET AND NO DIFFUSION, by Vernon O. Hoehne. Rept. on Contract Nonr-201(01). Jan 59, 73p. 6 refs. Engineering rept. no. 213-7; AD-210 034.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Shrouded propellers, Tests.

A shrouded propeller unit having 10 variable pitch propeller blades and 15 exit vanes was tested in the Walter H. Beech Memorial Wind Tunnel. The model embodied a 0.772 chord/diameter ratio shroud having a shroud inlet designed to simulate a high speed inlet flared to a reasonable static configuration and a non-diffused exit. Performance parameters were determined throughout a range of angle of attack from zero to 90° and advance ratios from zero to approximately 4.0 at various propeller blade pitch settings. Results are presented in the form of force, moment and power coefficients, and propulsive efficiencies varying with advance ratio and propeller blade pitch angle. (See also PB 157 282-6)

Chemical Engineering

PB 155 349 $3.60

Birmingham U. (Gt. Brit.)
WOVEN WIRE PACKINGS. Final technical status rept. Nov 59-Dec 60, on Contract DA 91-591-EUC-1344. [1960] 32p. 2 refs.

DESCRIPTORS: *Distilling plants, Wire screens, Effectiveness.

A number of modifications to Knitmesh Multifil Packing have been developed and tested. The modifications were based on the experimental determination of the liquid distribution in a 6 inch diameter Distribution Column. The liquid distribution was improved by two methods - (1) Insertion of obstructions to the core of the packing, in which the descending liquid had been found to concentrate. (2) Making the packing of horizontal instead of vertical layers of the mesh, thereby removing the central core of high density packing which is thought to be a cause of the central concentration of liquid. A theoretical treatment of the performance of packed columns is being developed. An attempt is being made to predict the spread of liquid down a column filled with simple packing. Theoretical equations for the liquid spread and the mass transfer have been derived and some solutions obtained for the liquid spread equations. These solutions involve parameters which must be determined experimentally. Apparatus for estimating these parameters is available and it is hoped that this work can be extended. (Author)

PB 157 709 $2.60

Mine Safety Appliances Co., Callery, Pa.
THE PREPARATION OF PENTABORANE AND THE EVALUATION OF THE HAZARDS OF HANDLING DIBORANE AND PENTABORANE, by S. L. Walters, R. M. Bovard and R. H. Shakely. Final rept. on Contract NOa(s) 9973. 1 Dec 50, declassified 11 May 54, 23p. Rept. no. MSA-9973-FR.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Diboranes, *Pentaboranes, Pyrolysis, Detonation, Handling, Borohydrides.

Pentaborane was prepared by the pyrolysis of diborane. Under the best conditions for a single pass through a hot tube, about 56% of the diborane passes through unchanged; about 40% of the reacted diborane is converted to pentaborane, giving an overall yield of 17 to 18% pentaborane. Approximately 25% of the solid hydrides collected is decaborane. Apparently the pyrolysis temperature should be in the range 250 to 260°, the contact time in the hot zone 3 to 11 seconds, and it makes little difference whether a diluent gas is used. An investigation was made of possible new methods of making pentaborane and other boron hydrides. Methylborate (a possible boron hydride intermediate) may be prepared directly from boron oxide and methanol using an excess of the former as a drying agent. Several addition compounds of ammonia with boron esters were prepared; one of these, $NH_3{:}B(OCH_3)_3$, is potentially rather inexpensive and may be of use in the preparation of borazole. Several possible new methods of producing boron hydrides are suggested and the results of the preliminary investigations appear promising. They give promise of producing such compounds at a greatly reduced price. These methods make use of the reactions of an active metal such as sodium with hydrogen and boron halides or esters; the metal may be used in the "atomized" form or as a suspension in an organic solvent. The reversibility of the reaction:

$$3LiBH_4 + LiBF_4 \underset{}{\overset{Et_2O}{\rightleftharpoons}} 2B_2H_6 + 4LiF$$

is tentatively established. A ballistics mortar and a Bichel gage were used to test the stability of diborane and pentaborane to mechanical shock. These compounds do not detonate when subjected to the shock produced by a No. 8 detonator.

TID-12811 $1.10

Rensselaer Polytechnic Inst., Troy, N. Y.
EXTRACTION OF INORGANIC SUBSTANCES BY ORGANIC SOLVENTS, by Herbert M. Clark. Progress rept. on Contract AT(30-1)-1663. 22 May 61, 7p.

Electrical and Electronic Engineering

PB 157 248 $5.60

Aeroelastic and Structures Research Lab., Mass. Inst. of Tech., Cambridge.
DEVELOPMENT OF A MINIATURE PRESSURE TRANSDUCER FOR APPLICATION TO AIRFOIL STUDIES IN THE SHOCK TUBE, by J. Ray Ruetenik. Rept. on Contract AF 33(616)5396. Dec 58, 58p. 8 refs. WADC Technical rept. 58-629; AD-206 259.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Airfoils, *Shock tubes, *Miniature electronic equipment, Pressure, Measurement, Barium compounds, Titanates, *Transducers.

A miniaturized pressure transducer was developed to measure the pressure on an airfoil in the shock tube. The transducer is only 1/8 inch thick, and furnishes a signal of about 0.1 volts per psi. Barium titanate was used as the element. The problem of charge leakage was solved. The strain and vibration sensitivity was considerably reduced, as was the thermal sensitivity. These questions are discussed in detail, and the final configuration is presented from which transducers can be built.

PB 157 574 $3.60

Armour Research Foundation, Chicago, Ill.
REVISION OF STANDARDS FOR MEASUREMENTS OF SHIELDING EFFECTIVENESS OF ENCLOSURES, by D. P. Kanellakos and H. M. Sachs. Final rept. 18 June 58-30 Sep 59, on Contract NObsr-72824. Oct 59, 33p. 6 refs. ARF Proj. E108.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Electromagnetic shielding, Effectiveness, Standards.

This report covers proposed revised standards for measurements of shielding effectiveness of enclosures as a result of a research program. The revised standard is a result of theoretical and experimental investigations attempting to improve military standard specification MIL-STD-285 for testing shielded enclosures in the frequency range of 100 kilocycles to 10,000 megacycles. The improved standard proposes to extend the low frequency end of the specification, and has been formulated in terms of tests at 15 kilocycles, at the lowest natural resonant frequency of the enclosure, and near nine kilomegacycles. The reasons for choosing these frequencies are: (1) at the low frequencies, shielding against low-impedance fields is comparatively difficult; (2) at the mid-frequencies, enclosures exhibit resonances which can significantly affect the performance of the enclosure; and (3) at very high frequencies, shielded enclosures exhibit phenomena not predictable from their performance at the lower frequencies.

PB 157 710 $1.60

Avion Div., ACF Industries, Inc., Alexandria, Va.
FILTER STUDY. Final engineering rept. for 15 Jan-31 Dec 56, on Contract AF 30(602)1449. 15 Dec 56, 19p. AD-131 258.

This report released for sale to the public 8 Sep 61

DESCRIPTORS: Electrical networks, Programming, Design, Radar tracking, Targets, *Radiofrequency filters, *Band-pass filters, *Waveguide filters, *Low pass filters, *High pass filters, *Electric filters, Handbooks, Radio communication systems.

This report consists of reprints of the summaries and conclusions of the four previous interim engineering reports, recommendations for future work, and the table of contents of a Filter Handbook that was prepared as part of the contract.

PB 157 575 $5.60

Bell Telephone Labs., Inc. [Whippany, N. J.]
RESEARCH AND DEVELOPMENT WITH HERMETICALLY SEALED CONTACTS, by O. M. Hovgaard. Quarterly progress rept. no. 8, 15 Dec 58-14 Mar 59, on Contract DA 36-039-sc-72835. 14 Apr 59, 57p. AD-219 606.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Electric switches, Design, Model tests, *Electric relays.

Studies of the capability of the G29 switch were completed and primary data obtained on life tests are given. In order to gain a further understanding of the factors affecting the tolerances which may be placed on the operating characteristics of a miniature relay employing G29 switches and providing two form C contacts, a special model is under design which will permit replacement of switches without disturbing the relay magnetic structure. Preliminary studies of the design of a coordinate switching array aimed at wideband transmission indicates that in the early experimental stages it will be advantageous to study the transmission and the control problems separately. (Author)

PB 157 576 $1.60

Bell Telephone Labs., Inc. [Whippany, N. J.]
RESEARCH AND DEVELOPMENT WITH HERMETICALLY SEALED CONTACTS, by O. M. Hovgaard. Quarterly progress rept. no. 9, 15 Mar-15 June 59, on Contract DA 36-039-sc-72835. 14 July 59, 15p. AD-227 090.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Electric switches, Design, Model tests, *Electric relays.

The preliminary design of a latching relay using two G29 miniature dry-reed switches and suitable for application as a crosspoint in a coordinate array has been completed. An 8 by 8 array of such 2-switch crosspoints is under construction for the purpose of studying the interaction between crosspoints. Another array using four switch relays is also under construction to permit a study of the application of such relays to high frequency switching. (Author) (See also PB 157 575)

PB 157 577 $1.60

Bell Telephone Labs., Inc. [Whippany, N. J.]
RESEARCH AND DEVELOPMENT WITH HERMETICALLY SEALED CONTACTS, by O. M. Hovgaard. Quarterly progress rept. no. 10, 15 June-14 Sep 59, Contract DA 36-039-sc-72835. 14 Oct 59, 20p. AD-230 935.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Electric switches, Design, Model tests, *Electric relays.

The assembly of an 8-by-8 exploratory miniature switching array employing two G29 miniature dry-reed switches in a latching relay for each cross-point is

about half complete. Another 3-by-3 coordinate array of relays each providing four G29 switches was completed. Exploratory studies of various relays types using G29 switches examined the relationship of the length of switch external leads to relay operating power levels. (Author) (See also PB 157 576)

PB 157 241 $9.10

Bolt, Beranek and Newman, Inc., Cambridge, Mass. DESIGN OF THE HIGH INTENSITY NOISE TEST FACILITY, by George Kamperman and others. Rept. on Aeroelasticity, Vibration and Noise, Contract AF 33(616)5274. Oct 58, 104p. WADC Technical rept. 58-367; AD-202 561.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Electronic equipment, *Test facilities, *Noise, *Noise generators, Airborne, Fatigue (Mechanics), Vibration.

The facility described is for performing research and development on the prevention of noise-induced fatigue damage on electronic equipment and structures. The facility has been designed primarily for progressive wave testing at high sound intensities. A special high intensity sound source has been developed for this facility. This sound source will cover the frequency range from 50 to 10,000 cps with a maximum acoustic power output of 22,000 w. The sound source will be programmed to produce pure tones or narrow bands of noise having a controlled peak-to-rms ratio.

PB 157 550 $21.00

Bureau of Naval Personnel, Washington, D. C. NAVAL SONAR. 1953, declassified. 397p. 1 ref. NAVPERS 10884.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Sonar, *Sonar personnel, *Sonar equipment, Underwater sound equipment, Naval personnel, Textbooks, Handbooks, Underwater sound transmission.

Naval Sonar was prepared primarily as a text for a correspondence course for use in training Naval Reserve electronics officers. The aim in preparing this book has been to present a general over-all view of underwater sound principles and sonar equipment. Naval Sonar will serve as background information for officer personnel and advanced enlisted ratings who may be called upon to learn the details of installation, operation, and maintenance of sonar equipment.

PB 157 240 $5.60

Cruft Lab., Harvard U., Cambridge, Mass. AN EXPERIMENTAL SYSTEM FOR STUDYING THE ZEROS OF NOISE, by Gerald M. White. Technical rept. on Contract Nonr-1866(16). 10 May 57, 58p. 14 refs. Technical rept. no. 261; AD-135 934.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: Radio communication systems, Theory, *Noise (Radio)

For many years researchers in the field of statistical communications have been interested in the zeros problem, i.e., the statistical distributions of the times a random voltage waveform passes through zero value. One of the most common waveforms investigated experimentally and theoretically is Gaussian noise. An experimental system for generating and measuring the zeros of Gaussian noise is described. Various zero-crossing distributions found in the literature are briefly derived and calculations performed for the spectra that were experimentally synthesized. When the calculated distributions were checked with the experimental distributions from the system described, close agreement was reached. (Author)

PB 157 597 $4.60

David Sarnoff Research Center, Princeton, N. J. RESEARCH IN ELECTRON EMISSION FROM SEMICONDUCTORS, by R. E. Simon and E. K. Gatchell. Quarterly rept. no. 1 (Rept. no. 9), 1 Oct-31 Dec 60, on Contract DA 36-039-sc-87388, continuation of Contract DA 36-039-sc-78155. [1961] 49p. 67 refs. AD-254 178.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Field emission, Semiconductors, Tests, Mathematical analysis, Electrons, Temperature, *Cold cathode tubes, *Cathodes, Electron tubes, Materials.

The purpose of this contract is to study hot electron emission with the following aspects in mind: (1) Basic investigation of hot electron emission, with the voltage applied across a semiconductor p-n junction varying over a wide range. (2) Production of low electron affinity surfaces by suitable activation processes with alkali metals. (3) Attempts to produce p-n junctions parallel to the vacuum interface to obtain electron emission from larger areas. A review of the pre-breakdown hot electron effects in semiconductors is presented. This review is based on a study of the experimental and theoretical investigations in the literature. The mechanisms which limit the electron energy are outlined and the limitations of the theories are discussed. The results of the theoretical work on the field dependence of the electron temperature are applied to a hot electron emitter of simple geometry. The possibilities of obtaining hot electron emission from materials other than those studied so far are discussed. (Author)

PB 157 672 $2.60

Eagle-Picher Research Labs., Miami, Okla. RESEARCH INVESTIGATION OF PHYSICAL CHEMISTRY AND METALLURGY OF SEMICONDUCTOR MATERIALS, by K. F. Bean and R. J. Starks. Quarterly rept. no. 2, 1 Mar-1 June 59 on Contract DA 36-039-sc-78246. [1959] 30p. AD-220 237.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Semiconductors, Design, Boron, Crystals, Growth, Preparation, Production, Thin films, Physical chemistry, Metallurgy, Materials, Boron compounds, Bromides, Carbides, Tantalum.

Preparation and purification of the B halide: A new reactor tube was designed for use in the synthesis of BBr_3. Only a small amount of BBr_3 was produced before stoppage occurred in the necked-down area. Normal production was attained after the reaction tube was redesigned and extended 6 in. out of the furnace at the bottom. Boron with a purity beyond spectrographic limits of detection, was produced by using a clear silica distilling unit fitted with dry ball and socket joints. Decomposition of BBr_3: Boron was produced by the H reduction of BBr_3 with deposition on a hot Ta filament. BBr_3 was obtained by the bromination of boron carbide and purified by distillation. Deposition of crystal bar B, on the Ta, which can be slipped from the substrate: After the B deposit is removed from the Ta filament, the B crystal bar can be melted into a solid bar in the floating zone; it can be used as a B filament for further B deposition or as an end product. Densification and zoning of B: The center portion of the zoned bar was more dense, free of visible cracks or defects, with no evidence of coring. Electrical and spectrographic data: Silicon, Fe, Cu, V and Ca impurities were concentrated at the bottom of the vertical bar. The resistivity values of the various sections of the float-zoned B decreased from the top section toward the bottom, from 1.2 to 0.76×10^0 ohm-cm. All B specimens were p-type.

PB 157 671 $1.60

Edgerton, Germeshausen and Grier, Inc., Boston, Mass.
A STUDY OF RADIATION EFFECTS ON ELECTRONIC DEVICES, by Harold S. Sauer. Quarterly rept. no. 3, 1 July-31 Aug 59 on Contract DA 36-039-sc-78171. 1 Oct 59, declassified 11 Nov 59, 14p. EG&G rept. no. B-1965; AD-228 837.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Electron tubes, *Radiation effects, *Transistors, Tests, Radiation damage, *Test reactors, Gamma rays, Electronic equipment.

It is announced that certain undescribed equipment, built and assembled for the study of radiation effects on electronic devices, has performed adequately in recording radiation effects data at two nuclear reactors.

PB 157 674 $12.00

Electrical Engineering Research Lab., U. of Illinois, Urbana.
THE ASYMMETRICALLY EXCITED SPHERICAL ANTENNA, by Robert C. Hansen. Technical rept. no. 3 on Contract AF 33(616)310. 30 Apr 55, 161p. 57 refs. AD-66 220.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Dipole antennas, *Antenna radiation patterns.

An analysis is made of the spherical dipole with asymmetric feed. A technique is demonstrated for finding the radiated fields of such a nonuniformly excited dipole. By assuming a constant distribution of tangential electric field across the gap, a method is established for deducing the Φ distribution (spherical coordinates are used) of the gap field. The synthesis technique developed allows azimuthal patterns to be produced by sectoral dielectric loading. Good correlation was obtained between measured and computed results for cardioid and fan-beam examples.

PB 157 675 $9.10

Electrical Engineering Research Lab., U. of Illinois, Urbana.
AXIALLY EXCITED SURFACE WAVE ANTENNAS, by D. E. Royal. Technical rept. no. 7 on Contract AF 33(616)310. 10 Oct 55, 104p. 19 refs. AD-75 731.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Antennas, Excitation, Couplings, Waveguides, Antenna radiation patterns.

Tests showed that it is feasible to excite a traveling wave dielectric slab antenna by coupling it along its direction of propagation to an adjacent waveguide. The mode purity was greater than by exciting the antenna at one end. The theory employed to estimate the phase velocities in the radiating and exciting guides gave results in close agreement with measured values. The aperture field of the desired hybrid mode is equivalent to an array of normal electric dipoles provided the surface density of the dipole distribution is related in a certain simple fashion to the Hertzian potential describing the hybrid field. To obtain an end-fire beam over a wide range of frequencies, the relative phase velocities of both the exciting and radiating guides must be maintained very near unity over the band, and this can be accomplished by proper dimensioning of the guides. The coupling theory indicates that a large attenuation constant in the radiating guide, a small attenuation constant in the exciting guide, and equal or nearly equal phase constants are required to obtain patterns having large front to back lobe ratios when the radiating guide is abruptly terminated. The coupling between the guides is maximum under these conditions.

PB 157 676 $6.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
USE OF COUPLED WAVEGUIDES IN A TRAVELING WAVE SCANNING ANTENNA, by Robert Henry MacPhie. Master's thesis. Technical rept. no. 36 on Contract AF 33(616)6079. 30 Apr 59, 67p. 8 refs. AD-215 558.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Antennas, Design, *Waveguides, *Waveguide couplers.

This report describes an antenna that scans in the end-fire region. The two cases considered have scans from $\phi = 0^o$ (end fire) to $\phi = 23^o$ and from $\phi = 12^o$ to $\phi = 30^o$. The aperture length in both cases is approximately ten wavelengths. The scan is continuous, but the beam amplitude varies considerably and efficiency is low. The antenna design, however, is relatively simple requiring only one phase shifting device which may be electronic. (Author)

PB 157 263-1 $4.60

General Electric Co., Syracuse, N. Y.
WIDE-BAND MAGNETIC RECORDING SYSTEM. Interim engineering rept. no. 1, 2 July-2 Sep 52, on Contract AF 33(600)19190. 22 Sep 52, declassified 31 July 58. 50p. 3 refs. AD-3497.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Magnetic recording systems, *Broadband, Design, Electronic equipment.

The wide-band magnetic recording (WMR) system was designed to record and reproduce signals in the range 1 kc to 3.4 mc, with the capability of extension to greater bandwidths. The input signal is sampled at a 6.8-mc rate and recorded simultaneously on 18 parallel magnetic tape tracks. Signal samples are fed in at a 378-kc rate through low-pass filters having a cutoff frequency of 189 kc. The recorder-reproducer has 20 signal channels, each with a flat frequency response from 1 to 200 kc. The following components of the multiplexing and demultiplexing equipment were constructed: input and output video amplifier units; pulse generator, sampler, and adder; and 9-channel 189-kc filter and amplifier and 18-channel 189-kc amplifier-units. The experimental tape-transport mechanism for the recorder-reproducer showed that more precautions are necessary to prevent disturbances in the tape stock rolls from reaching the recording head, and improved guides are necessary to reduce tape skew. A magnetic record-reproduce head assembly made of Ferroxcube 1-90-1 had 18 good gaps; Mylar was the gap spacer.

PB 157 263-2 $8.10

General Electric Co., Syracuse, N. Y.
WIDE-BAND MAGNETIC RECORDING SYSTEM. Interim engineering rept. no. 2, 2 Sep-2 Nov 52, on Contract AF 33(600)19190. 22 Nov 52, declassified 31 July 58. 83p. 2 refs. AD-3425.

This report released for sale to the public 8 Sep 61

DESCRIPTORS: Video signals, *Magnetic recording systems, *Broadband, Design, Multiplex transmission, Electronic equipment

Tests were made on the electronic portion of the system to determine the effects of the multiplexing process on the video signal. A demultiplexer pulse generator was developed to aid in the critical process of reconstructing the original signal from its samples. Output pulses were obtained which were nearly identical in height and width [about 30 v and 0.15 μsec, respectively]. The alignment procedure for the electronic portion of the system is described. Twenty-channel ferrite record-reproduce heads gave better performances than Mu Metal heads because of their low losses and high abrasion resistance. (See also PB 157 263-1)

PB 157 263-3 $3.60

General Electric Co., Syracuse, N. Y.
WIDE-BAND MAGNETIC RECORDING SYSTEM. Interim engineering rept. no. 3, 2 Nov 52-2 Jan 53, on Contract AF 33(600)19190, declassified 31 July 58. 33p. 4 refs. AD-3424.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Magnetic recording systems, *Broadband, Electronic equipment, Design

See also PB 157 263-2

PB 157 263-4 $4.60

General Electric Co., Syracuse, N. Y.
WIDE-BAND MAGNETIC RECORDING SYSTEM. Interim engineering rept. no. 4, 2 Jan-2 Mar 53, on Contract AF 33(600)19190. 13 Mar 53, declassified 31 July 58. 46p. 4 refs. AD-13 868.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Magnetic recording systems, *Broadband, Design, Electronic equipment.

Tests of the multiplexing and demultiplexing system indicated that spurious output responses resulting from recombination of channel time samples were reduced to a satisfactorily low amplitude. The nulls in the overall recording-system response at integral multiples of the channel sampling frequency introduce negligible errors in the output signal for purely random input signals. Special measures may be required satisfactorily to record and reproduce repetitive signals which have appreciable components corresponding to the recorder system nulls. Preliminary tests indicate that the model II tape-transport mechanism is superior to model I and can handle a 15-min roll of tape. (See also PB 157 263-3)

PB 157 263-5 $2.60

General Electric Co., Syracuse, N. Y.
WIDE-BAND MAGNETIC RECORDING SYSTEM. Interim engineering rept. no. 5, 2 Mar-2 May 53, on Contract AF 33(600)19190. 22 May 53, declassified. 21p. 5 refs. AD-17 381.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Magnetic recording systems, *Broadband, Design, Electronic equipment.

The schematic of a channel gating scheme is presented which employs 3 diodes instead of 2. The additional diode is connected to a 6.8-mc sine-wave source which is synchronous with the 378-kc channel sampling pulses. The potential of the sampling junction in this circuit can rise to the instantaneous value of the channel signal only when the channel sampling pulse is applied and when the 6.8-mc sine wave has a positive peak. By connecting each junction to the same 6.8-mc sine-wave source, the variation of the sampled pulse widths along the channels can be greatly reduced. A new demultiplexer synchronizer is being developed in which unmodulated 6.8 mc is obtained from a reactance-tube-controlled oscillator. The reactance-tube excitation is obtained from a phase detector which compares the phase of pulses at a 126-kc rate (obtained by counting down from the 6.8-mc oscillator output) and the 126-kc signal from the recorder-reproducer. The 6.8-mc and 378-kc outputs are fed through variable deadly sections to provide for system alignment. The playback head servo system did not adequately reduce the effects of tape skew when the head

mount had a 25-c resonance. A higher (100-c) resonance will be employed. (See also PB 157 263-4)

PB 157 263-6 $3.60

General Electric Co., Syracuse, N. Y.
WIDE-BAND MAGNETIC RECORDING SYSTEM. Interim engineering rept. no. 6, 2 May-2 July 53, on Contract AF 33(600)19190. 22 July 53, declassified. 40p. 7 refs. AD-18 863.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Magnetic recording systems, *Broadband, Design, Electronic equipment.

The operation of a new diode adder is discussed. This is an outgrowth of a resistive adder arrangement in which Ge diodes were used to replace the series resistors in the adder network. A block diagram is included to show the major additions to the system to provide for individual channel synchronization. The mixing, separation, and timing circuits were breadboarded, but no further development is planned for this synchronizing method until more accurate measurements are made on the linearity of skew and its effect on the complete system operation. The development of a multiplexer synchronizer was completed, as was the development of the new demultiplexer synchronizer (AD-17 381). New skew recordings revealed a slow skew drift not exceeding 3.5 μsec peak to peak, and a predominant periodic component of skew at about 22 c which has a peak-to-peak amplitude of about 1.5 μsec. Nonlinear skew is believed not to exceed 10% of the total skew. Tests on the head servo system indicated less than 0.1 μsec of skew between channels no. 1 and 20. Several potentiometers were eliminated from the original phase detector circuit, and an additional clipping circuit was added to decrease its sensitivity to amplitude changes. The output filter was improved to give better 21-kc rejection. Several modifications in the dc amplifier circuit are also reported. Signals were passed through the complete system and the output signal revealed a great deal of interference which was attributed to skew, drop-outs, channel noise, and improper adjustment of channel gains. (See also PB 157 263-5)

PB 157 263-7 $2.60

General Electric Co., Syracuse, N. Y.
WIDE-BAND MAGNETIC RECORDING SYSTEM. Interim engineering rept. no. 7, 2 July-2 Sep 53, on Contract AF 33(600)19190. 22 Sep 53, declassified 15 June 54. 27p. 7 refs. AD-21 151.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Magnetic recording systems, *Broadband, Design, Electronic equipment

Further work on the diode adder (AD-18 863) was discontinued, and the diode-triode sampler and adder unit (AD-3425) was restored to the system. A demultiplexer sampler and adder unit was designed to eliminate slow drift in adjustments and stray feed-through signals. An output video amplifier is under construction which is to have a maximum gain of about 10 and a flat frequency response up to 5 mc. To permit simultaneous aural cueing of recorded video information, a communication channel was developed with design objectives of a maximum carrier deviation under modulation of ±10 kc, an upper AF-response limit of 5 kc, and an audio harmonic distortion of less than 3%. These objectives were obtained by conventional FM techniques with a reactance-tube-modulated 100-kc oscillator and a Foster-Seeley type discriminator. The audio S/N of the channel is about 35 db. Lock-in reliability of the head servo was increased so that the servo remains locked in through a complete 15-min run. Operation of the complete system resulted in initial poor quality output signals, but the quality war steadily improved by debugging and aligning the system. Fixed differences in time delay were discovered between record and playback among the various channels. The various timing and amplitude errors introduced by the tape recording and reproducible process are believed to be capable of being held within usable limits. (See also PB 157 263-6)

PB 157 263-8 $10.10

General Electric Co., Syracuse, N. Y.
WIDE BAND MAGNETIC RECORDING SYSTEM, by W. P. Bartley and D. E. Maxwell. Interim engineering rept. no. 8, 2 Sep 53-15 Jan 54, on Contract AF 33(600)19190. 15 Sep 55, 125p. 15 refs. AD-74 205.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Magnetic recording systems, *Broadband, Design, Electronic equipment

Progress to date is summarized. Three separate recorder-reproducer equipments were wholly or partially developed during the contract period. The model I machine is essentially a breadboard design, and was constructed primarily to facilitate development of HF record and playback heads. The model II equipment, which was used in all 3.4-mc system tests, provides twenty 200-kc tape channels and uses 2-in.-wide tape at a speed of 200 in./sec. Model III, which is still under development, also provides twenty 200-kc channels, but employs 1 1/4-in.-wide tape at a speed of 100 in./sec. Operation of the 3.4-mc system indicated that the frequency response is close to the 3.4-mc objective. The feasibility and soundness of the time-division multiplex approach were successfully demonstrated. While the system suffers from poor S/N and non-uniformity of the response-frequency characteristic, these deficiencies appear to reflect no theoretical limits on performance, but rather the need for improved multiplexing and recording techniques. (See also PB 157 263-7)

PB 157 263-9 $10.50

General Electric Co., Syracuse, N. Y.
WIDE BAND MAGNETIC RECORDING SYSTEM. Interim engineering rept. no. 9, 15 Jan-31 July 54, on Contract AF 33(600)19190. 18 Aug 54, 132p. 10 refs. AD-54 143.

This report released for sale to the public 20 Oct 61.

DESCRIPTORS: *Magnetic recording systems, *Broadband, Design, Electronic equipment.

During the period covered by this present report, major emphasis has been placed upon two general areas of development: (a) improved multiplex system techniques, and (b) higher-resolution record and playback heads.

In order to expedite completion of item (a) above, the 3.4 mc (18-channel) first research model was converted to a 1.134 mc, six-channel system. (See also PB 157 263-8)

PB 157 263-10 $9.60

General Electric Co., Syracuse, N. Y.
WIDE BAND MAGNETIC RECORDING SYSTEM. Interim engineering rept. no. 10, 1 Aug-1 Nov 54, on Contract AF 33(600)19190. 3 Nov 54, 114p. 10 refs. AD-49 914.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Magnetic recording systems, *Broadband, Electronic equipment.

The 1.1-mc system is considered satisfactory for recording and reproducing many types of CW and pulse signals. The system resolution is very close to the theoretical limit for a 1.1-mc bandwidth. The chief deficiency in performance is a S/N of 20 db or less. Substantial improvement in the S/N is anticipated through the use of channel AGC. The tape transport Model III has a flutter content comparable to the best commercially available transports. Single crystal ferrites have too low permeabilities for good heads. The bulk wearing properties of the GE developed ferrites and single crystals are good. When soft spacers are used, the gap erodes noticeably in less than 9 hr at a 100-in./sec tape speed. Artificial cracks such as the gap appeared to be the seat of most erosion; natural cracks do not erode. The glazed-gap construction appeared to have superior wearing properties. The GE ferrite heads may retain a useable 1/2-mil resolution for a reasonably long period of wear. One Mumetal and 3 ferrite heads were produced with a useable resolution of 1/4 mil; 2 of the ferrite heads are marginally useful at 1/5 mil. Fabrication techniques appeared to limit the gap size and quality. (See also PB 157 263-9)

PB 157 263-11 $6.60

General Electric Co., Syracuse, N. Y.
WIDE BAND MAGNETIC RECORDING SYSTEM. Interim engineering rept. no. 11, 1 Nov 54-1 Feb 55, on Contract AF 33(600)19190. 11 Feb 55, 65p. 10 refs. AD-60-725.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Magnetic recording systems, *Broadband, Design, Electronic equipment.

During the period covered by this report, major emphasis has been placed on three areas of development: (1) tape transport development including flutter reduction on the Model III tape transport and preliminary design studies of a smaller Model IV tape transport which will be more compatible with Air Force weight requirements; (2) high resolution head development including work on ferrite and metallic heads; (3) electronic development including an investigation of channel automatic gain control. (See also PB 157 263-10)

PB 157 263-12 $6.60

General Electric Co., Syracuse, N.Y.
WIDE BAND MAGNETIC RECORDING SYSTEM. Interim engineering rept. no. 12, 1 Feb-1 Apr 55, on Contract AF 33(600)19190. 23 Sep 55, 62p. 4 refs. AD-82 526.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Magnetic recording systems, *Broadband, Design, Electronic equipment, Multiplex transmission.

During the period covered by this report, major emphasis has been placed on three areas of development: (1) electronic equipment development; (2) tape transport development; and (3) high resolution head development. (See also PB 157 263-11)

PB 157 673 $4.60

[Hamilton Standard Div., United Aircraft Corp., Windsor Locks, Conn.]
POWER SOURCE FOR TRANSISTORIZED ELECTRONIC EQUIPMENT USED IN U.S. ARMY AIRCRAFT, by G. O. Johnson, Jr. Quarterly progress rept. no. 3, 1 Jan-31 Mar 59 on Contract DA 36-039-sc-78002. Apr 59, 41p. AD-216 150.

This report released for sale to the public 8 Sep 61

DESCRIPTORS: *Power supplies, *Electronic equipment, *Electrical equipment, Airborne, Transients, Transistors, Aircraft.

An evaluation was made of transient protective circuits utilizing the D.C. electrical system mock-up. (Author)

PB 157 262 $10.50

Instrumentation Lab., Mass. Inst. of Tech., Cambridge.
ENGINEERING DATA FOR 2.0-INCH SERIES OF MICROSYN ELECTROMAGNETIC COMPONENTS, by P. J. Gilinson, Jr. and R. G. Haltmaier. Rept. on Contract W 33-038-ac-13969. Nov 51, declassified 5 Nov 53. 138p. 5 refs. Rept. R-16; ATI-136 308.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Synchro receivers, *Generators, Electrical equipment, *Synchros, Specifications, Design.

The purpose of this paper is to provide general information concerning the 2.0-inch series of Microsyn electromagnetic components developed by the M.I.T. Instrumentation Laboratory. Diverse information, including (1) comparison of models, (2) design characteristics of each model, (3) nominal performance values, (4) production test specifications, (5) performance curves, (6) assembly drawings, (7) detail drawings, and (8) manufacturing and assembly procedures, is contained in the report.

PB 147 141 $7.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE AN/FRC-47 (XD-1) MOCK-UP SYSTEM PERFORMANCE RESULTS, by B. E. Nichols. Rept. on Contract AF 19(604)5200. 23 Apr 59, 71p. 13 refs. Technical rept. no. 203; AD-216 370.

DESCRIPTORS: *Multichannel telephone systems, Model tests, Multiplex transmission, Radio teletype systems, *Ultra high frequency, Radio communication systems.

The AN/FRC-47 radio set is a long-range multichannel telephone communications system operating in the UHF band with single-sideband modulation and is capable of providing reliable communications over distances up to 600 miles. Transmission is by the tropospheric-scatter mode of propagation. The input pass band of the radio equipment is 12 to 112 kc; 100 kc of bandwidth for twenty-four 3-kc-wide frequency-division multiplex telephone voice channels. This band is frequency translated - first to 16 mc and finally to 350 to 450 mc in the UHF band, using mixers with filters to select the upper sidebands. A linear klystron power amplifier raises the level to 3-kw average power, 20-kw peak power. Pilot frequencies inserted at a low level at each end of the signal band are also transmitted to provide the receivers with control signals for automatic gain control, automatic frequency control, automatic bandpass slope equalization, and for demodulation of the single-sideband signal. Results of tests performed on a 639-mile mock-up system are given. Anticipated performance of the Dew Drop system and of a 500-mile system are presented. (Author)

PB 156 652 $2.60

Mallory, P. R., and Co., Indianapolis, Ind.
SUBMINIATURE VARIABLE RESISTORS, by Howard Reeve and Harold Austin. Quarterly progress rept. no. 2, 15 May-15 Aug 56, on Contract DA 36-039-sc-71165. [1956] 29p. AD-133 596.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Variable resistors, *Subminiature electrical equipment, Design, Tests.

Two groups of the bushing-mount and flat-mount resistors were constructed and subjected to performance tests. The first group of each of these resistors incorporated plastic base resistance elements and some mechanical design features which needed to be proven by testing. Some modifications were made during the tests to obtain satisfactory operation of the resistors. The second group of the resistors incorporated modifications proven by tests and also were equipped with ceramic base resistance elements. These resistor designs were established as the preliminary development model designs and the resistors were tested in accordance with the specified requirements. Although some deficiencies (mostly concerned with the techniques involved in forming the resistance element) were evident, the general performance of the resistors was considered quite satisfactory. Construction and testing of the multiturn resistors demonstrated that, although the design appears quite complex, construction is rather easily accomplished and shows promise in perfecting features difficult to employ in subminiature multiturn resistors. Difficulty in producing suitable resistance elements constituted the major deficiency noted during performance tests. Aside from the need for increased strength in the rotational stop section, the resistors operate satisfactorily mechanically and the resistor design is believed to be suitable. Preliminary development model samples were submitted to the Signal Corps for examination. (Author)

PB 157 687 $14.00

Microwave Lab., Stanford U., Calif.
FIELD-EMISSION CATHODE MICROWAVE DEVICES, by J. Fontana. Technical rept. on Contract Nonr-255(48). Apr 60, 206p. 31 refs. M. L. rept. no. 700; AD-238 390.

This report released for sale to the public 8 Sep 61

DESCRIPTORS: *Field emission, *Cathodes (Electron tubes), Microwave equipment, Diodes, Mathematical analysis, Frequency multipliers, Circuits, Microwave amplifiers, Modulation, Electron tubes, Design.

The field emission effect is discussed in relation to devices for microwave amplification and harmonic generation where the high current densities and minute dimensions of field-emission cathodes are especially desirable. The characteristics of field-emission diodes are expressed in terms of parameters dependent upon paraboloidal geometry for the emitter and collector. An application of the emission modulation properties is given in the design of a microwave 2-cavity amplifier, including the operating characteristics and expected performance. Nonlinear properties of RF emission from biased emitters subjected to RF fields is expressed by an approximate analytical procedure. The typical values obtained in the computations demonstrate possibilities for using this nonlinearity in harmonic generators at microwave and millimeter wave frequencies. Equivalent circuits are used to analyze the operation of 1-cavity and 2-cavity harmonic generators. The design and construction of a one-cavity harmonic generator tube operating with a 3 kmc fundamental frequency are described. This tube was designed principally to study the field-emitter characteristics and to obtain quantitative measurements of the harmonic amplitudes in the emitted current. Some preliminary test results are given. (Author)

PB 157 691 $11.00

Naval Research Lab., Washington, D. C.
ANALYSIS OF SYSTEMS FOR THE RECORDING OF EXPONENTIAL SIGNALS, by R. V. Talbot, J. R. Shipman and others. Apr 54, 146p. 11 refs. NRL Rept. no. 4354

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: Cathode ray tubes, Transmission lines, Display systems, Electrical networks, Electronic circuits, *Nuclear weapons, Tests, *Electronic recording systems, *Video signals.

An analysis is presented of the requirements of a recording system to be used in recording single nonrecurrent signals of the form $Ke^{\alpha t}$ with the range of α (alpha) being from approximately 1×10^8 to 20×10^8 sec^{-1}. The recording of such signals is particularly important

in nuclear measurements on atomic weapons. Particular attention is given to the response of the more important system components such as detectors, transmission lines, signal amplifiers and cathode-ray tubes. The capabilities and limitations of each are discussed. It is found that for a linear system the primary effect of each component is to cause a reduction in the relative amplitude of the signal, resulting in a reduction in the dynamic range of the system. Some attention is also given to the response of certain system elements to other type signals including impulse functions, step functions, ramp functions and sinusoids. The effects of nonlinear elements are considered rather briefly. From this analysis conclusions are drawn and recommendations made concerning the selection of the most suitable system elements and the arrangement of these elements. Where possible, suggestions have been given as to possible future developments. (Author)

PB 157 229 $1.60

Navy Electronics Lab., San Diego, Calif.
A COMPARISON OF FIVE INTELLIGIBILITY TESTS FOR VOICE COMMUNICATION SYSTEMS, by W. E. Montague. 27 June 60, 11p. 9 refs. Research and Development rept. no. 977; AD-254 545.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Voice communication systems, Tests Test methods, *Speech.

The scores of five intelligibility tests presented with a masking noise were compared. It was found that one test, which in its design restricts the number of possible alternatives per word, was simpler to administer and score than the other tests, consumed about half the time, and had lower intersubject variability. Although more data should be obtained, it is suggested that this alternative restricting test be considered for use in the evaluation of communication systems. (Author)

PB 157 228 $1.60

Navy Electronics Lab., San Diego, Calif.
MODEL STUDIES ON VLF ANTENNA GROUND SYSTEM DESIGN, by W. E. Gustafson, T. E. Devaney, and A. N. Smith. 16 Dec 57, 15p. 6 refs. Research rept. no. 822.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Very low frequency, Radio communication systems, Model tests, *Antennas.

Model studies were made to find the effect of the number and length of ground system radials upon the input impedance of a vlf transmitting antenna. The results obtained were interpreted in terms of the theory developed by Wait and Pope for lf ground systems. It was found that the theory in its present form can be used to predict the component of base resistance which is the result of losses reflected from beyond the edge of the ground system. Within the ground system, at vlf, an added component of loss must be considered which is associated with the vertical component of the electric field. (Author)

PB 157 661 $8.10

New Mexico U. Engineering Experiment Station, Albuquerque.
RADAR RETURN AT NEAR-VERTICAL INCIDENCE, by A. R. Edison, R. K. Moore and B. D. Warner. Summary rept. on Contract N123 (60530) 18138A. Sep 59, 84p. 121 refs. Technical rept. no. EE-24; AD-227 447.

This report released for sale to the public 8 Sep 61

DESCRIPTORS: *Radar targets, *Radar echo areas, Analysis, *Antenna radiation patterns, Reflection, Earth, Water, Scattering.

An experimental program to investigate the reradiation properties of terrain at near-vertical incidence was carried out by the Sandia Corporation. Data were obtained at 415 and 3800 mc, using narrow-pulse type radar at altitudes of 2000 to 12000 feet over many different target areas. At frequencies over 400 mc most terrain acts as a scatterer of energy even at near-vertical incidence. The backscattering "radiation pattern" of the ground drops off rapidly for most target areas as the angle of incidence is increased from the vertical reference position. An exception occurs for heavily wooded areas which appear as nearly isotropic scatterers. At 415 mc the radar cross section per unit area at vertical incidence ranges between values of 0.7 for woods to approximately 4 for city targets while at 3800 mc the variation ranges between values of 0.8 for woods to about 18 for some city targets. The values for water are considerably higher and may reach 50 at 415 mc and 200 at 3800 mc. If the ground were a lossless isotropic scatterer the radar cross section per unit area would be 2 at vertical incidence. The experimental backscattering patterns agree reasonably well with predictions based on a simplified statistical model for ground roughness. (Author)

PB 152 305 $3.60

Pacific Semiconductors, Inc., Culver City, Calif.
INTRINSIC-BARRIER TRANSISTOR TECHNIQUES (SILICON), by J. L. Buie, M. A. Clark and others. Quarterly rept. no. 1, 1 July-15 Oct 57, on Contract DA 36-039-sc-74887. [1957] 35p. 3 refs. PSI Rept. no. 3000:15-4-Q; AD-149 499.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Transistors, *Silicon, High frequency, Diffusion.

The design theory for a 200 mc, 100 mw silicon transistor indicates that this must be an n-p-i-n, intrinsic-barrier transistor. The fabrication of a suitable structure requires the use of solid-state diffusion. Processes have been developed for a 100 mc, lower power transistor. This work was performed prior to the present contract, but its status is, of necessity, described in this report because it represents the starting point for the development of intrinsic-barrier transistors. These processes are shown to be in good control and npn transistor characteristics are given. (Author)

PB 152 307 $3.60

Pacific Semiconductors, Inc., Culver City, Calif.
INTRINSIC-BARRIER TRANSISTOR TECHNIQUES (SILICON), by J. L. Buie and J. Cohen. Quarterly rept. no. 3, 15 Jan-15 Apr 58, on Contract DA 36-039-sc-74887. [1958] 35p. PSI rept. no. 3000:15-10-Q; AD-162 323.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Transistors, *Silicon, High frequency, Diffusion.

The laboratory processing of n-p-i-n silicon transistors is discussed along with several notes on current experiments and structure evaluation methods. Recent units have met the objective specification of producing 100 mw of power output at 200 mcps when operated as a self-excited oscillator; however, the efficiency is low (13%), and steps are being taken to correct this. Various electrical tests, including high-power oscillators at 70 and 100 mcps, switching characteristics, and high ambient temperature tests are described. (See also PB 152 305)

PB 157 236 $9.60

Radiation Lab., Johns Hopkins U., Baltimore, Md.
A STUDY OF THE PHASE PRINCIPLE OF SIGNAL DETECTION, by E. Gott. Rept. on Contract AF 33(616)3374. July 59, 113p. 19 refs. Technical rept. no. AF-70; AD-219 722.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Signals, Detection, Radiofrequency, Radiofrequency power, *Phase detectors.

A theoretical investigation of the zero-zone spectral distribution of the output power is made from the statistical point of view. To facilitate the analysis, the theory of complex Gaussian processes is explored. A new expression for the 2n-variate probability density function, incorporating complex covariance matrices and determinants, is introduced. This new expression was proved with the help of a theorem and three corollaries on determinants which are proved in the appendix. In order to take advantage of the theory of complex Gaussian processes, a complete system of complex variables and functions, representing narrow-band noise, filter networks, and covariances is developed. The applicability of these complex representations is based on the fact that a narrow-band noise satisfies the definition of a complex Gaussian process. By using these tools, the expression for the zero-zone power spectrum of the phase sensitive detector is found with the saving of a large amount of labor. Experimental equipment of the phase sensitive detector plus an input system and a measuring system are described and recordings of the zero-zone power spectrum for various input conditions are made. (Author)

PB 157 679 $3.60

Radiation Research Corp., New York.
NUCLEAR BATTERIES, by John H. Coleman. Quarterly progress rept. no. 2, 15 Feb-15 May 57 on Contract DA 36-039-sc-73115, continuation of Contracts DA 36-039-sc-42564, DA 36-039-sc-64479, DA 36-039-sc-70117, and DA 36-039-sc-71132. [1957] 35p. AD-138 426.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Radioactive batteries, Design, Tritium, Radiochemistry, Radioactive isotopes, Krypton, Materials.

The following 3 tritium battery components were investigated: the tritium source, the collector, and the enclosure. Two foils which contain 50 c were made in the tritium-source production system. The foils were cut into smaller pieces for use in all battery types. A collector surface with 2 layers of C had a higher efficiency under limited production conditions. Several enclosure types were designed with 2 different terminals. Models of 2 tritium battery types were fabricated. The model R and R1 series producing 0.1 mμa were completed and tested. The model R2 producing over 1.0 mμa was fabricated and tested. A third battery producing 10 mμa was designed to determine the upper limit. A solid center-pin structure was proposed which eliminates 3 steps in the processing and reduces from 2 to 1 the seals requiring process control for vacuum integrity. A krypton battery which uses the model R enclosure was designed.

PB 157 678 $2.60

Radiation Research Corp., New York.
NUCLEAR BATTERIES, by John H. Coleman. Quarterly progress rept. no. 3, 15 May-15 Aug 57, on Contract DA 36-039-sc-73115, continuation of Contracts DA 36-039-sc-42564, DA 36-039-sc-64479, DA 36-039-sc-70117, and DA 36-039-sc-71132. [1957] 28p. 2 refs. AD-145 426.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Radioactive batteries, Design, Tritium, Radiochemistry, Radioactive isotopes, Beta particles, Materials.

Three tritium battery types models R, R_B and R2 were produced and tested. Life data extending over three months indicates the output current decreases with time due to the presence of internal gas. A preliminary analysis indicates the source of this gas is the carbon collector which was vacuum baked at 150°C maximum due to the low operating temperature of the tritium-titanium source. Literature references indicate the quantity of gas retained is a function of temperature; therefore, the production process using a bell jar system has been changed to allow a vacuum bake above 1000°C. The construction of this basic system has been completed and development is underway on refining techniques to obtain highest vacuum integrity. (Author) (See also PB 157 679)

PB 171 963 $4.00

Radio Corp. of America, Camden, N. J.
MICRO-MODULE PRODUCTION PROGRAM. Quarterly rept. no. 9, 1 Apr-1 July 60, on Contract DA 36-039-sc-75968. 262p. AD-245 506.

DESCRIPTORS: *Subminiature electronic equipment, Electronic equipment, *Electronic circuits, Circuits, *Capacitors, *Diodes, *Transistors, *Resistors, *Communication equipment, Semiconductors, Digital computers, Production.

The production and testing of final-grade capacitor microelements have continued. Final reports on Sprague multilayer ceramic capacitors and Mallory electrolytic capacitors were received and reviewed. Acceptance tests and delivery of final-grade resistor and inductor microelements for modules are underway and all transistor microelements required for modules under the Initial Program were made available for module assembly. Some diode manufacturing problems are still being solved, but electrical parameters of F-1 diodes are satisfactory and F-2 diodes have operated in modules under adverse conditions. Delivery of prototype crystal units was completed and fabrication of the final-grade units is in progress. Life testing of all prototype-grade modules for the Initial Program was completed and a brief analysis of the results is included. Production and testing of final-grade modules for the Initial Program is underway. The subassembly tasks include the AN/PRC-34 subassemblies for the Initial Program, and the Helmet Radio Set and the MicroPac Computer both under Program Extension II. Final revisions were made of printed circuit layouts for the first of these, and environmental and life-tests were made on several subassemblies. The prototype design of the Helmet Radio Receiver-Transmitter was begun. Changes in this equipment include the use of Clevite ceramic resonators in a portion of the receiver and a change to phase modulation in the transmitter. (Author) (See also PB 171 126)

PB 157 667 $7.60

Radio Corp. of America, Somerville, N. J.
PRODUCT REFINEMENT. LOW POWER SILICON VHF TRANSISTOR, by F. Katnack, D. C. Hughes, Jr. and others. Final technical engineering rept. for 5 June 59-5 June 60, on Contract AF 33(600)39606. Mar 61, 71p. AMC Technical rept. 61-7-732.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Very high frequency, *Transistors, Silicon, Design, *Manufacturing methods, Industrial production, *Automation.

An n-p-i-n silicon transistor was designed for 100-v, 250-megacycle operation. A pilot line process was developed that is suitable for large-volume production of this transistor. Devices were fabricated that met both the static and 250 mc requirements specified in the contract. An Automatic Device Assembly Machine (ADAM) was demonstrated that gives promise of up to 400 units per operator hour.

SCR-250 $2.60

Sandia Corp., Albuquerque, N. Mex.
GRID BLACKOUT IN VACUUM TUBES, by K. D. Hardin. June 61, 25p.

SCTM-98-61-14 $8.60

Sandia Corp., Albuquerque, N. Mex.
PRACTICAL ANALYSIS OF BLOCKING OSCILLATORS, by Richard D. Griffith. Apr 61, 97p.

PB 157 669 $1.60

[Stanford Electronics Labs.] Stanford U., Calif.
A MICROWAVE SWITCH EMPLOYING GERMANIUM DIODES, by Donald J. Grace. Technical rept. no. 26 on Contract Nonr-225(10). 17 Jan 55, 12p. AD-55 838.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Germanium, Crystals, Crystal rectifiers, *Diodes, Design, *Switches, Radiofrequency, Microwaves, Electronic equipment.

"A fast-acting r-f switch employing germanium diodes has been developed at this laboratory. The diodes are incorporated in a microwave filter structure, the 'on' and 'off' conditions being achieved by changing the bias voltage applied to the diodes. The switch employs four Type 1N91 germanium diode power rectifiers. It operates over the 2.5 to 3.5 kMc/s frequency band with a switching range of 12.0 to 15.5 db and a maximum insertion loss of 3.5 db. About 0.5 microsecond is required to turn the switch on, and 15 to 20 microseconds to turn it completely off." (Contractor's summary)

PB 157 256 $9.10

United Electrodynamics, Pasadena, Calif.
DIELECTRIC BREAKDOWN INVESTIGATION, by L. Zukerman. Scientific rept. no. 5A, 1 July 57-1 Feb 58, on Cable, RF Coaxial, Low-Loss, High Temperature, Contract AF 33(616)5189 and Subcontract to Martin Co., Contract AF 04(645)56. 15 Aug 58, 110p. 23 refs. AD-202 799.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Insulating materials, *Dielectrics, Radiofrequency, Coaxial cables, Guided missiles, *Radiofrequency cables, Materials, Temperature, Voltage, Cavity resonators, Electric insulation, Electric cables.

A method is described for testing hard, high-temperature insulating materials for dielectric breakdown strength over a range of temperatures from -200 to + 1000°F and frequencies from 10 to 10,000 Mc/sec. Reentrant resonant cavities are used as voltage transformers, with the dielectric material placed in the reentrant section. The cavities are tunable to accommodate a wide variety of materials with varying thicknesses and dielectric constants. Breakdown of the material causes detuning of the cavity, indicated by a sudden decrease in the monitored field strength. Breakdown voltage can be calculated from measurements of Q, VSWR, and power. (Author)

PB 157 690 $7.60

Vitro Labs., Silver Spring, Md.
HANDBOOK FOR THE PREDICTION OF SHIPBOARD AND SHORE ELECTRONIC EQUIPMENT RELIABILITY, by R. G. Stokes. Rept. on Contract NObsr-77519. Apr 61, 73p. 4 refs. Technical rept. 133; NAVSHIPS 93820.

This report released for sale to the public 8 Sep 61

DESCRIPTORS: *Electronic equipment, Shipborne, Reliability, Mathematical prediction, *Handbooks.

Several methods are demonstrated, each to be used for a specific phase in the evolution of a design from initial rough concept to final detailed design disclosure. All methods are based on the same mathematical concept, differing only in the degree of detail required in the prediction. Such an approach permits a rough reliability estimate based on the class of equipment, or a slightly better estimate based on the number of active elements, or an even better estimate based on the actual number of parts of all categories included in the design, or a best estimate based on the number of parts and their severity of application. A rough estimate may be made in a few minutes, but the best estimate may require weeks of analysis. In addition to prediction procedures, failure rate data are provided for classes of equipments, classes of parts, and individual parts such as electron tubes. (Extracted)

AD-261 036 $0.50

Watervliet, Arsenal, N. Y.
TECHNIQUE OF APPLYING ELECTRICAL INSULATING VARNISH TO THIN METAL STRIPS, by T. M. Pochily and R. H. Hill. Nov 60, 13p. Technical rept. WVT-RI-6003-1.

DESCRIPTORS: *Conductors, *Varnishes, Insulating materials, *Electric insulation, *Organic coatings.

A technique was developed to apply insulating varnish to electrical conductors having a rectangular cross section 0.005 inches thick by 0.093 inches wide. Sharp corners and burrs of high curvature posed several difficulties. Surface tension caused the insulating varnish to become thin where the conductor had a high curvature. This is also the place where the electrostatic field is concentrated. As a result, the insulation often times failed at this place. A method of applying an adequate thickness of insulation to the high field region in spite of the surface tension is described. The thickness deposited on adjacent flat surfaces was not excessive. Strips of conductor so insulated will pass the 'megger' test, which requires insulation resistance of at least 50 megohms at 500 volts d.c. The method developed did not break down when the voltage had been increased to 4000 volts (the maximum output of the tester). The insulation, therefore, had a breakdown point of approximately 400 volts RMS (60 cycles) per mil of thickness.

Ordnance, Missiles, and Satellite Vehicles

PB 157 664-1 $14.50

Air Proving Ground Center, Eglin Air Force Base, Fla.
HYPERVELOCITY IMPACT. SYMPOSIUM [No. 4] APRIL 26-28, 1960, SPONSORED BY U. S. ARMY, NAVY, AND AIR FORCE. VOLUME 1. Sep 60, 220p. 66 refs. APGC-TR-60-39(1); AD-244 475.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Hypervelocity guns, Hypervelocity projectiles, Terminal ballistics, Conferences, Test facilities.

Contents:
Hypervelocity gun for micrometeorite impact simulation employing capacitor discharge in a condensed phase
An exploding wire hypervelocity projector
Acceleration of projectiles with the sequenced high explosive impulse launcher
A multi-stage hypervelocity projector
Electroballistic techniques
Experimental production of hypervelocity pellets by means of condenser discharges in hydrogen
The addition of electrical energy to helium
The fexitron - a new, short pulse, high intensity x-ray tube
Studies of hypervelocity impact on lead
An experimental study of crater formation in metallic targets
Hypervelocity penetration studies
Mechanics of hypervelocity impact of solids
Cratering; experiment and theory
Effects of target temperature on hypervelocity cratering

PB 157 664-2 $18.00

Air Proving Ground Center, Eglin Air Force Base, Fla.
HYPERVELOCITY IMPACT. SYMPOSIUM [NO. 4] APRIL 26-28, 1960. SPONSORED BY U. S. ARMY, NAVY, AND AIR FORCE. VOLUME II. Sep 60, 282p. 83 refs. APGC-TR-60-39(II); AD-244 476.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Hypervelocity guns, *Hypervelocity projectiles, *Terminal ballistics, Test facilities, Conferences.

Contents:
A high explosive gun test range
The traveling charge gun as a hypervelocity launching device
Some consideration on the performance of highly compressed gases in hypervelocity projection
Effects of intermolecular interactions on thermodynamic properties of gases at high temperatures and pressures
The application of interior ballistic theory in predicting the performance of light gas hypervelocity launchers
The comparison between ORDVAC predictions for the performance of a WSL/BRL light-gas gun and some experimental firings
Interior ballistics of the NRL light-gas gun
Practical low-cost light-gas gun
A hypervelocity impact system using the relative velocity of two projectile accelerators
Metallurgical observations of high speed impact
An experimental investigation in lead of the Whipple "Meteor Bumper"
Volume-energy relation from shaped charge jet penetrations
The re-entry simulation range
Studies of surface pitting due to alloy formation at elevated temperatures
Observations of the phenomena of hypervelocity impact

PB 157 664-3 $15.50

Air Proving Ground Center, Eglin Air Force Base, Fla.
HYPERVELOCITY IMPACT. SYMPOSIUM [NO. 4] APRIL 26-28, 1960. SPONSORED BY U. S. ARMY, NAVY, AND AIR FORCE. VOLUME III. Sep 60, 233p. 47 refs. APGC-TR-60-39(III); AD-244 477.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Hypervelocity guns, *Hypervelocity projectiles, *Terminal ballistics, Conferences, Test facilities.

Contents:
Framing camera observations of ultra-high velocity penetration in transparent targets and a mechanism for crater expansion
An analytical approach to hypervelocity impact mechanics
Impact crater formation in rock
A model of oblique impact
Further studies of micro-particle cratering in a variety of target materials
A metallurgical approach to the hypervelocity problem
High-velocity-projectile drag determination
Experimental investigation of spray particles producing the impact flash
An investigation of spalling and crater formation by hypervelocity projectiles
Ballistic impacts by microscopic projectiles
The penetration of thin rods into aluminum
A sequential electrical discharge-light gas gun

PB 157 268 $2.60

Cook Electric Co., Skokie, Ill.
CINE-THEODOLITE ACQUISITION AND TRACKING DRIVE EQUIPMENT, by Jay Warshawsky. Monthly letter rept. no. 8 for 16 May-15 June 55 on Contract AF 08(606)802. 18 July 55, 25p. Rept. no. P-760; AD-92 959.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Guided missile tracking systems, Design, *Optical tracking, Optical equipment, *Phototheodolites.

The basic design of the ACTADE system was completed, and effort is being directed toward the completion of the components and testing and debugging of the completed units. The block diagram of the final system is given. The remote-control signal flow proceeds essentially from left to right with 3 dc voltages which represent parallax corrected x, y, and z coordinates serving as the input signals and the theodolite motion serving as the desired output. In the local-control mode or when supplying supplementary local control in the remote mode, the signal flow proceeds into an intermediate voltage amplifier and summation (IVA) circuit. A detailed description is given of the input system which converts the dc input signals to ac, performs the necessary earth curvature correction computations, and presents the signals to the resolvers. The error output of each resolver is fed to an AGC amplifier and error storage unit. The IVA amplifies the error signal and the local-control signal, and serves as a summing circuit by adding algebraically the servo-error signal, the local-control signal, and the compensated tachometer signal for producing the motor-drive signal. The newly designed azimuth precision spur gear train was installed in the theodolite and proved satisfactory.

PB 157 685 $1.60

Materials Lab., Wright Air Development [Div.] Wright-Patterson Air Force Base, Ohio.
FINAL EVALUATION AND DEVELOPMENT OF A "Y" SERIES PERISCOPIC BOMBSIGHT REUSABLE CUSHIONING AND PRESERVATION SYSTEM, by L. G. Robinson. Feb 54, 14p. Technical note WCRT 54-29; AD-25 902.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Vibration isolators, Shock resistance, *Bombsights, Vibration, Countermeasures, Tests.

Six cushioning and preservation systems were tested with a properly balanced, 203-lb, dummy bombsight. A shear-pad system and a latex-bound animal-hair system passed all the drop and vibration tests. The 440-lb shear-pad system was recommended since the mounting provisions appear adaptable to other bomb sights.

PB 154 083 $1.60

McCrone, Walter C., Associates, Chicago, Ill.
THE CRYSTALLOGRAPHY OF EXPLOSIVES. PHASE I. CRYSTAL STRAIN IN LEAD AZIDE. PHASE II. CRYSTAL STRUCTURES OF EXPLOSIVES, by Leonid V. Azaroff and Walter C. McCrone. Quarterly rept. no. 2, 1 Aug-31 Oct 60, on Contract DA 11-022-ORD-3412. 30 Dec 60, 12p. 4 refs.

DESCRIPTORS: *Lead compounds, Azides, *Explosives, *Crystal structure.

Spontaneous detonation in lead azide is due to strain energy caused in turn by rapid crystal growth. A given crystal will detonate spontaneously when it grows rapidly enough to accumulate sufficient lattice strain so that this strain energy when suddenly released by spontaneous fracture or cleavage of the crystal exceeds the activation energy for detonation. One of the primary objectives of this investigation is the elucidation of the crystal structure of lead styphnate. (See also PB 152 062)

PB 157 549 $16.00

Naval Ordnance Lab., White Oak, Md.
THE DEVELOPMENT OF IMPACT SENSITIVITY TESTS AT THE EXPLOSIVES RESEARCH LABORATORY, BRUCETON, PENNSYLVANIA DURING THE YEARS 1941-1945, by H. Dean Mallory, ed. 16 Mar 56, declassified 15 June 61. 243p. 63 refs. NAVORD rept. 4236.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Explosives, *Sensitivity, Test methods, Test equipment.

This NAVORD Report consists of reproductions of reports which are no longer generally available. They report work carried out in 1942-45 at the Explosives Research Laboratory, Bruceton, Pa. The Bruceton Impact Machine (now used at the Naval Ordnance Laboratory) is

described, and the development work with it is fully reported. It is as a result of this investigation of 14 different tool types (hammer and anvil combinations) and of other variables affecting the test value that the present NOL standardized impact sensitivity test for high explosives was selected.

PB 154 554 $3.60

Naval Ordnance Test Station, China, Lake, Calif.
A GENERALIZED GRAPHICAL METHOD OF DETERMINING THEORETICAL THRUST COEFFICIENTS FOR RAMJETS, by William F. Hassel. Nov 60, 35p. 13 refs. NAVWEPS rept. 7068; NOTS TP 2473.

DESCRIPTORS: *Ramjet engines, Design, Thrust, Determination.

A series of graphs was constructed that permits determination of the design parameters and the thrust coefficient of a supersonic ramjet engine when the engine is required to operate over a range of Mach numbers and altitudes, at both on- and off-design conditions. Several refinements were made to account for effects usually neglected in other methods of ramjet analysis, such as the effect of fuel injection upon flow Mach number and the presence of nongaseous particles in the exhaust. (Author)

PB 157 666 $2.60

Picatinny Arsenal, Dover, N. J.
SIMPLE, RAPID, INFRARED METHOD FOR THE DETERMINATION OF NITROGLYCERIN, TRIACETIN, AND 2-NITRODIPHENYLAMINE IN CASTING SOLVENT, by A. H. Castelli, M. Halik and others. Apr 54, 23p. 5 refs. Technical rept. 2021.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: Casting, Organic solvents, *Infrared spectroscopy, *Nitroglycerin, *Triacetin, *Amines, Phenyl radicals, Nitro radicals, Determination

A simple method is described for the determination of nitroglycerin, triacetin, and 2-nitrodiphenylamine in casting solvent of the following nominal composition: Nitroglycerin, 70%; Triacetin, 29%; 2-Nitrodiphenylamine, 1%. The method is applicable over the following ranges: Nitroglycerin, 61-85%, Triacetin, 24-32%, 2-Nitrodiphenylamine, 0.8-1.7%. The complete analysis of casting solvent can be accomplished in less than 45 minutes. The method involves for each component: (1) preparing a solution of suitable concentration of casting solvent in ethylene chloride, (2) measuring the infrared absorbance of this solution at the peak of a specified absorbance band (5.75 microns for triacetin, 6.0 microns for nitroglycerin, and 6.65 microns for 2-nitrodiphenylamine), and (3) obtaining the percent of the ingredient from a previously prepared working curve of absorbance vs concentration. The use of the working curve for 2-nitrodiphenylamine involves an easily applied correction to compensate for deviations from nominal composition of nitroglycerin and triacetin in analyzed samples.

PB 156 770 $1.10

Remington Arms Co., Inc., Bridgeport, Conn.
DEVELOPMENT AND FABRICATION OF PERCUSSION PRIMER FOR BAG LOADED WEAPONS, by R. A. Sahlin. Monthly progress rept. 1 Dec-31 Dec 60, on Contract DA-19-020-ORD-5200. 10 Jan 61, 3p.

DESCRIPTORS: *Primers, Design, *Weapons

The first 1500 XM-82 primers of the basic Picatinny design have been completed and delivered. The fabrication of container closures and container cups including staking of the rupture profile has been completed for the second 1500 primers. (Author)

PB 156 771 $1.10

Remington Arms Co., Inc., Bridgeport, Conn.
DEVELOPMENT AND FABRICATION OF PERCUSSION PRIMER FOR BAG LOADED WEAPONS, by R. A. Sahlin. Monthly progress rept. for 1-31 Jan 61 on Contract DA 19-020-ORD-5200. 13 Feb 61, 3p.

DESCRIPTORS: *Primers, Design, *Weapons

Work has been curtailed due to lack of a full compliment of screw machine parts for the second lot of 1500 XM-82 primers. All Remington fabricated parts and screw machine parts from outside vendors have been received except XM-82 bodies. (See also PB 156 770)

SC-4617(RR) $0.75

Sandia Corp, Albuquerque, N. Mex.
A COMPARISON OF STAGNATION-POINT HEATING IN A ROCKET EXHAUST TO THAT OF ACTUAL FLIGHT, by Frank L. Paris, Jr. Aug 61, 32p.

SC-4589(RR) $2.75

Sandia Corp., Albuquerque, N. Mex.
DESIGN OF THE SANDIA HIGH-ALTITUDE SAMPLER ROCKET SYSTEM (HAS), by A. C. Bustamante and W. E. Walker. Aug 61, 146p.

MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

PB 157 665 $3.60

Battelle Memorial Inst., Columbus, Ohio.
A FUNDAMENTAL STUDY OF BEARING BEHAVIOR, by R. W. Dayton, C. M. Allen and others. Final rept. for 1 Nov 46-31 Dec 52 on Contract N5ori-111, T.O. 3. 31 Dec 52, 37p. 32 refs. ATI-191 896.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Journal bearings, *Bearings, Friction, Lubrication, Materials, Copper, Failure (Mechanics), Hydrodynamics, Load distribution, Torque.

Experiments are described that supported the hypothesis that, under certain conditions of bearing operation, in the region of hydrodynamic lubrication, a small hot spot

could develop, and because of self-aggravation, and poor heat dissipation, could continue to grow in size: once this region of unstable lubrication is entered, there is no limit to the size of the growth of this hot spot before failure. The first test of this hypothesis was made by measuring the dielectric strength of the oil film between a bearing and its journal, as a means of estimating the minimum thickness of the oil film. This was accomplished by applying a potential between the bearing and the journal and observing the breakdown voltage on an oscillograph. This technique was very successful in showing the changes of oil-film thickness in an operating bearing. It was found that, as load was applied to the bearing, the oil film gradually decreased in thickness. A limiting load was reached which caused the sudden rupture of the oil film. If the bearing were allowed to continue operation at this load, failure would occur. However, if the load were decreased slightly, the oil film would recover, and the bearing would continue operation indefinitely. A measurement of the friction torque was used as a second means of testing the hypothesis. It was found that increases of frictional torque lagged behind the film rupture and that important increases of torque occurred only late in the failure process. This also is in accord with the hypothesis. An infrared detecting device was used to find whether hot spots formed. None were seen except for a heat flash at the time of complete failure. Bearing tests were made of a variety of materials. Pure copper behaved as well as many conventional bearing materials. The only circumstances which caused failure at a low load were the use of a relatively soft shaft and the presence of any grit. Under these conditions, severe galling occurred, and complete seizure resulted at a low load. Under other conditions copper performs as well as most other conventional bearing materials, even in the presence of dirt.

AD-259 556 $0.75

Rock Island Arsenal Lab., Ill.
PERFORMANCE OF DRILLING PROCESSES ON HARD METALS, by J. J. Weintraut. 14 Mar 61, 26p. 5 refs. Rept. no. 61-1040.

DESCRIPTORS: *Drilling machines, Metals, *Drills, *Tool steel, Cutting tools, Machining, Electric discharges, Carbide tools, Tests.

The performance of various drilling processes was investigated by producing holes in hardened tool steel of 52 Rc. Tests were conducted with several types of drills such as a carbide-tipped drill with coolant hole, solid-carbide drill, cast-alloy drill and electrodes adaptable to an electrical-discharge machine. Performance was evaluated on the basis of machine time, workpiece finish, holes per regrind, hole size and thrust and torque requirements. Results indicated that each drilling process is a practicable method to produce holes in hard metals. The carbide-tipped drill with coolant hole was superior in machine time, workpiece finish and the number of holes produced. The solid-carbide drill was the next-best performer in these areas. Variations in hole size were the lowest with the carbide-tipped drill with coolant hole and the solid-carbide drill. The cast-alloy drill and electrical-discharge process produced holes with slight taper. Thrust forces were high for the solid-carbide drill as compared to the cast-alloy drill and their torque requirements were not significantly different. The carbide-tipped drill with coolant hole should be considered for production-lot jobs on hard metals. For machining one hole or a small quantity of holes, the solid-carbide drill was evaluated as the most suitable tool. Machining performance of the electrical-discharge machine indicated that this process is best suited for hard-to-machine jobs where the quality of the product can be improved and/or the expenditure for the work can be reduced. The cast-alloy drill is most applicable to jobs where high production and close tolerances are not demanded. (Author)

MATERIALS

PB 157 273 $1.10

Armour Research Foundation, Chicago, Ill.
AN INVESTIGATION OF METAL-CERAMIC COMPOSITES FOR HIGH-TEMPERATURE APPLICATION, by Thomas S. Tully. Monthly progress rept. no. 2 1-31 May 59, on Contract DA 11-022-505-ORD-3038. 15 June 59, 7p. Rept. no. ARF-2175-2; AD-217 806.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Refractory materials, Metals, *Ceramic materials, Bonding, *Cermets.

During the current period attention has been directed toward selection of materials and the initiation of experimental work. Ceramic and metallic materials were chosen on the basis of the ratio of their thermal expansivities.

PB 171 967 $2.50

Radiation Effects Information Center, Battelle Memorial Inst., Columbus, Ohio.
THE EFFECT OF NUCLEAR RADIATION ON SILICONE ELASTOMERIC AND PLASTIC MATERIALS, by Ramona Mayer, N. J. Broadway and S. Palinchak. Rept. on Contract AF 33(616)6564, continuation of Contract AF 33(616)5171. 15 Oct 59, 104p. 36 refs. REIC rept. no. 9.

DESCRIPTORS: *Silicones, *Elastomers, *Plastics, Radiation effects, Resins, Polymers.

This report presents the state of the art on the effects of nuclear radiation on silicone elastomeric and plastic materials from 1952 to 1959. The report summarizes the radiation-effects information on the various silicone elastomers and plastics and products made from these materials. Information on radiation effects on silicone fuels and lubricants has not been included. The report is intended to be sufficiently inclusive to make it valuable as a guide on effects which can be anticipated from nuclear radiation on silicone elastomers and plastics.

PB 157 799 $9.60

Sperry Gyroscope Co., Great Neck, N. Y.
METAL-TO-CERAMIC SEAL TECHNOLOGY STUDY, by S. S. Cole, Jr. H. W. Larisch and others. Final technical rept. for 22 June 59-22 Sep 60, on Contract AF 30(602)2047. Oct 60, 119p. 29 refs. Sperry rept. no. NA-8240-8216; RADC-TR-60-236; AD-248 535.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: Aluminum compounds, Analysis, *Ceramic materials, *Electron tubes, *Seals, Tensile properties, Mechanical properties, Thermodynamics, *Metal seals, Sintering, Stresses, Metals, Oxides, Brazing, Tests, Glass, Bonding.

A literature survey on ceramic-to-metal sealing techniques, adherence theory, and allied systems disclosed limited published work and no procedures for achieving ultra-high-strength seals or seals to pure high alumina. Reported work on adherence mechanisms is limited to chemical reaction and molybdenum oxide reaction theories. Two additional theories were formulated for this study--one proposing the migration of the glass in the ceramic into the metallizing mixture, and the other recognizing the need for promoting metallizing sintering. These theories, together with thermodynamic and equilibrium calculations, allowed 200 metallizing compositions to be formulated. Three sintering temperatures were chosen, depending on composition, for each of the 200 metallizing mixtures. Each mixture was applied to specimens of 94-, 96-, and 99.6-percent alumina. Testing involved a screening technique whereby the most promising compositions were carried through to increasingly refined test techniques (scratch and peel, circumferential seal, and finally tensile tests). Approximately 3200 specimens were prepared and tested. The tensile test specimen was redesigned to eliminate shoulder breaks when evaluating ultra-high-strength seals. A photoelastic study was made to learn more about stress distribution in this specimen. Extremely strong seals were developed for all the ceramic bodies considered. A wide variety of sealing compositions was disclosed which produced seals stronger than those previously reported. Careful analysis of the data indicated that the Glass Migration Theory should receive careful consideration and that simple chemical reactions were not enough to explain seal adherence. A study was made of the origin and nature of seal stresses resulting from the dissimilar physical properties of metals and ceramics. A method to calculate stresses in ceramic-to-metal seals is theorized. Measurements of the properties of the metal and of residual stresses in seals were made, showing excellent agreement with calculated stresses. (Author)

Fuels, Lubricants, and Hydraulic Fluids

PB 157 167 $1.60

Little, Arthur D., Inc., Cambridge, Mass.
LIQUID HYDROGEN SAFETY MANUAL. Rept. on Contract AF 18(600)1687. 19 Oct 59, 16p. Rept. C-61092.
This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Liquid hydrogen, *Liquefied gases, Safety, Containers, Hazards, Storage, *Liquid rocket propellants, Handling.

Contents:
General properties
Hazards
Safety measures
Transfer and storage
Shipping
Recommended safety instruction format

PB 157 439 $10.10

Shell Development Co., Emeryville, Calif.
FUNDAMENTALS OF GEAR LUBRICATION, by V. N. Borsoff. Final rept. Mar 53-May 54, on Contract [NOa(s)] 53-356-c. [1954] 132p. 18 refs. Rept. no. S-13605; AD-42 584.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Gears, *Lubrication, Tests, Oils.

The effects of a number of gear geometry factors, operating variables and lubricant properties were investigated. The results show that unreactive mineral and synthetic oils lubricate gears by forming a thick film between the meshing surfaces. If this film is broken, scoring results. The facts that verify the existence of thick film lubrication are: operation at loads below the score load resulted in perfect preservation of the contacting surfaces; wear, as established by weighing or by a radioactive tracer technique, was undetectable and metal transfer non-existent. With respect to the effect of speed, two zones of thick film lubrication are recognized; in one, the deformation of the thick film is strictly viscous, in the other, the oil acts as an elastic solid. The latter begins when the duration of contact has decreased to the order of microseconds. With extreme pressure compounded lubricants, and loads above the score load of the base oil, the lubrication is performed through films formed by chemical reaction between the active ingredient of the compounding material and the metal. Depending on the nature of the active ingredient and the magnitude of the load, such films behave as 'thick' films, without any wear or metal transfer, or permit wear by abrasion and chemical corrosion. Studies of the oil supply, i.e., flow-rate, jet velocity and location of the oil supply nozzle, show that it is the amount of oil reaching the meshing point which is important to the establishment of a thick film with unreactive oils. Once established, the thick film behaves in accordance with the viscosity and relaxation properties of the oil under the pressures and temperatures within the film. (See also PB 152 755)

Plastics

PB 157 681 $4.60

Franklin Inst. Labs. for Research and Development, Philadelphia, Pa.
DEVELOPMENT OF IDENTITY TESTS FOR PLASTIC MATERIALS, by Marvin Packer. Quarterly progress rept. for 3 June-2 Sep 57, on Contract DA 36-034-501-ORD-66. [1957] 46p. 38 refs. Rept. no. Q-A2071-1; AD-145 878.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Plastics, Identification.

Results are presented of a survey of the literature in Chemical Abstracts from 1947 to 1957 on tests for identifying polystyrenes, phenolics, polyethylenes, polymethyl methacrylate, polyamide, Teflon, diallyl phthalate, silicone, alkyd, ethyl cellulose, cellulose acetate, and cellulose acetate butyrate.

PB 171 966 $2.25

Office of Technical Services, Dept. of Commerce, Washington, D. C.
PLASTIC PROGRESS UNDER GOVERNMENT SPONSORSHIP, by James Kanegis. July 61, 88p. 191 refs.

DESCRIPTORS: *Plastics, *Patents, Scientific research.

Results are summarized of government-sponsored research on plastics as determined by an analysis of government-owned patents published between April 1959 and April 1960, several hundred unclassified R&D reports (mainly "PB" reports of OTS) that were released between January 1959 and July 1960, and personal correspondence. (Reports older than 1957 were purposely neglected even if released in 1959 or 1960.) The cited patents cover the following topics: alkyds; flame- and shrinkproofing; phosphorus-containing; fluoroplastics; and miscellaneous. The R&D reports of greatest interest are reviewed in the following order: acrylics; alkyds, polyesters, and epoxides; foams; reinforcing materials and laminates; olefins, vinyls, and styrene plastics; silicones; fluoroplastics; inorganic polymers; miscellaneous plastics (transparent materials and others); irradiated plastics; adhesives; elastomers; fibers and textile finishes; and lubricants and fluids. This report supplements a previous study entitled New Plastic Materials Through Government Research (available from OTS for $2.25 as PB 161 332).

PB 171 810 $1.25

Plastics Technical Evaluation Center, Picatinny Arsenal, Dover, N. J.
THE APPLICATION OF NONDESTRUCTIVE TESTING TO PLASTICS, by Alfred M. Anzalone. July 61, 44p. 57 refs. PLASTEC note 1.

DESCRIPTORS: *Plastics, *Non-destructive testing, Ultrasonics, X-ray diffraction analysis.

Abstracts are presented of 25 papers on techniques involving ultrasonics and 16 papers on non-ultrasonic techniques. Papers published prior to 1957 are not included. The included papers were found as a result of a review of some 100,000 documents relating to nondestructive testing, ultrasonics, flaw detection, reinforced plastics, X-ray testing, radiography, magnetic particle inspection, and penetrants. (See also PB 161 947, PB 171 034 to 171 038)

MATHEMATICS

Computing Devices

PB 157 209 $2.60

David Taylor Model Basin, Washington, D. C.
MULTIGROUP TRANSPORT CODE RDR 5, by Charles Dawson. Dec 60, 25p. 5 refs. Rept. 1450.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Digital computers, Integral equations, Coding, Computers.

RDR 5 is a multigroup, slab geometry neutron transport code for the NORC computer. With features such as anisotropic scattering, as many as 99 lethargy groups, and a 10-point discrete ordinate approximation to the angular dependence of the vector flux, the code can provide solutions with considerable accuracy. The equations used in the code are derived, and the input for the code is described. The results obtained with different approximations that may be used in RDR 5 are compared. (Author)

TID-13315 $5.60

Digital Computer Lab., U. of Illinois, Urbana.
PART I. HIGH-SPEED COMPUTER PROGRAM; PART II. CIRCUIT RESEARCH PROGRAM; PART III. MATHEMATICAL METHODS; PART IV. DATA REDUCTION METHODS; PART V. ILLIAC USE AND OPERATION; PART VI. IBM 650 USE AND OPERATION; PART VII. GENERAL LABORATORY INFORMATION. Technical progress rept. on Contract AT(11-1)-415. Mar 61, 55p.

MECHANICS

NYO-2575 $3.60

Aeroprojects, Inc., West Chester, Pa.
APPLICATIONS OF ULTRASONIC ENERGY. Task 1: ULTRASONIC CHEMICAL PROCESSING. Task 2: ULTRASONIC METAL AND CERAMIC POWDER PROCESSING. Task 3: ULTRASONIC INSTRUMENTATION. Progress rept. no. 21 on Contract AT (30-1)1836. June 60, 32p.

WT-1474 $1.25

Holmes and Narver, Inc., Los Angeles, Calif.
TEST OF BURIED STRUCTURAL-PLATE PIPES SUBJECTED TO BLAST LOADING, by R. A. Williamson and P. H. Huff. Aug 60, 47p.

UCRL-6415 $1.50

Lawrence Radiation Lab., U. of California, Livermore.
THE HYGE SHOCK TESTER MANUAL, by K. W. Volkman. Rept. on Contract W-7405-eng-48. 21 Apr 61, 58p.

SCTM-117-61(13) $9.60

Sandia Corp., Albuquerque, N. Mex.
THE CONTROL AND MEASUREMENT OF MINUTE CURVATURES IN A STEEL SHAFT, by Donald F. Wilkes. Apr 61, 116p.

SCTM-175-61(73) $1.10

Sandia Corp., Albuquerque, N. Mex.
X-RAY, MOTION-PICTURE PHOTOGRAPHY AS A TOOL IN VIBRATION ANALYSIS, by D. Williams, Jr. July 61, 9p.

TID-13307 $5.60

Structural Mechanics Research Lab., U. of Texas, Austin.
STRESS-STRAIN CHARACTERISTICS OF MATERIALS AT HIGH STRAIN RATES. PART VII. FURTHER STUDIES OF DYNAMIC COMPRESSIVE YIELD STRESSES, by William L. Guyton. Rept. on Contract AT(29-2)-621. June 61, 59p.

SCDC-2361

Aerodynamics and Pneumatics

PB 157 693 $6.60

[Army Rocket and Guided Missile Agency] Redstone Arsenal, Ala.
STUDY OF AERODYNAMIC CHARACTERISTICS OF CONE-CYLINDER-CONICAL FRUSTUM BODIES BY LINEARIZED THEORY OF SUPERSONIC FLOW, by Raymond A. Deep and James H. Henderson. 8 June 55, 67p. 3 refs. Rept. no. 6R2P.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: Bodies of revolution, *Conical bodies, Aerodynamics, *Cylindrical bodies, *Supersonic flow, Design.

The initial normal-force-coefficient slope, center of pressure, and wave-drag coefficient were computed by the linearized theory for a systematic series of cone-cylinder–conical frustum bodies of revolution. Variations in cylinder length of 1, 3, and 5 calibers and frustum half-angles of 6, 14, and 22 deg were considered for Mach numbers of 1.3, 1.8, and 2.48. All combinations of cylinder length and frustum angle were preceded by a 45-degree total-angle nose cone, and the frustum diameter was varied from 1 to 3 cylinder calibers. The results are presented in a series of graphs suitable for design purposes. (Author)

PB 157 231 $2.60

Ohio State U. Research Foundation, Columbus, Ohio.
AXISSYMMETRIC NOZZLES FOR HYPERSONIC FLOWS, by John D. Lee. Rept. on Contract AF 33(616)5593. June 60, 29p. 3 refs. RF proj. 818; Rept. no. TN(ALOSU)459-1; WADC-TN-59-228; AD-225 314.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Hypersonic nozzles, Configuration, Heat transfer, Boundary layer, *Hypersonic wind tunnels, *Hypersonic flow.

General design criteria for axisymmetric contoured nozzles are reviewed and design methods for nozzles shorter than the minimum for perfect flow are suggested. The poly-Mach concept of using a given contour for a range of Mach numbers by interchangeable throat sections is proposed. Calibrations from two short-contour, poly-Mach nozzles are presented.. one for Mach numbers of 6.2, 7.2 and 8.1 and the other for Mach numbers of 8.5 and 12.8. Experimental information is also given for the influence of the shape of the throat, the magnitude of heat transfer rates through the throat region and the boundary layer thickness at the nozzle exit. (Author)

PB 157 250 $2.60

Polytechnic Inst. of Brooklyn, N. Y.
BOUNDARY LAYER OVER A FLAT PLATE IN THE PRESENCE OF SHEAR FLOW, by Lu Ting. Rept. on Aerodynamic and Heat Transfer Problems in Hypersonic Flow, Contract AF 33(616)6118. Aug 59, 23p. 6 refs. PIBAL rept. 524; WADC Technical note 59-334; AD-227 061.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Sheets, *Boundary layer, Hypersonics, Shear stresses, *Vortices, *Hypersonic flow.

The governing equations of an incompressible boundary layer over a flat plate in the presence of a shear flow with finite vorticity are derived. For large vorticity a similarity solution is obtained. For moderate vorticity one of the governing equations is replaced by an approximate one for which similarity solutions exist. (Author)

PB 157 257 $3.60

Polytechnic Inst. of Brooklyn, N. Y.
SOME HEAT CONDUCTION SOLUTIONS INVOLVED IN TRANSIENT HEAT TRANSFER MEASUREMENTS, by Robert J. Cresci and Paul A. Libby. Rept. on Aerodynamic Research, Contract AF 33(616)3265. Sep 57, 35p. 7 refs. WADC Technical note 57-236; AD-130 800.

This report released for sale to the public 8 Sep 61

DESCRIPTORS: *Heat transfer, Measurement, Hypersonic wind tunnels, Recording devices, Corrections, *Aerodynamic heating, Determination.

A transient method is discussed for obtaining heat transfer data in the Polytechnic Institute of Brooklyn hypersonic facility. The technique involves simple apparatus and instrumentation and allows tests to be run at variable Reynolds numbers. A cylindrical plug transforms the general 3-dimensional temperature distribution within the body to a local distribution arising from the one-dimensional heat flow in the plug. The analyses used in the determination of the local heat transfer rates are obtained by solving the one-dimensional heat conduction equation with a variety of boundary conditions. The boundary conditions are subdivided into those which are obtained for low rates of heat transfer and short heating times, and those where the model is subjected to high rates of heat transfer over a relatively long period of time. In each classification the boundary conditions specifying the details of heating are chosen which lead to solutions for constant heat transfer rate, arbitrary surface temperature, constant heat transfer coefficient, and arbitrary heat transfer rate. The standard heat conduction solutions are adapted for the particular conditions required for heat transfer measurements.

PB 157 260 $1.60

Princeton U., N. J.
THE DIFFRACTION OF A SHOCK WAVE AROUND A HOLLOW RECTANGULAR BLOCK-OPENING FACING SHOCK, by Walker Bleakney. Tentative rept. on Contract N6ori-105. 26 Oct 50, 10p. ATI-92 278.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Shock waves, Pressure, Diffraction, Fluid mechanics, Aerodynamics, Theory, Propagation.

Figures only.

PB 157 261 $6.60

Princeton U., N. J.
THE DIFFRACTION OF SHOCK WAVES AROUND OBSTACLES AND THE RESULTING TRANSIENT LOADING OF STRUCTURES, by D. R. White, D. K. Weimer, and Walker Bleakney. Technical rept. II-6 on Contract N6ori-105, Task IL 1 Aug 50, 61p. 1 ref. ATI-85 382.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Shock waves, Pressure, Diffraction, Structures, Drag, Aerodynamics, Fluid mechanics, Theory.

PB 157 284 $6.60

Stanford U., Calif.
EXTENSION OF COOLING FIN THEORY. APPLICATION TO AXIAL FLOW HEAT TRANSFER SURFACES WITH LONGITUDINAL FINS, by R. K. Pefley. Technical rept. no. 47 on Contract Nonr-225(23). 31 Oct 59, 61p. 7 refs. AD-230 105.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Fins, *Cooling, Heat exchangers, Gas flow, *Heat transfer, Cylindrical bodies, Thermodynamics, Theory.

Fins are commonly added to a heat transfer surface to increase the area in contact with the gas. The fins are frequently added in such a way as to create thin rectangular or wedge-shaped passageways through which the gas moves. The conventional solution assumes that the gas mixes such that its temperature is constant transverse to the flow direction. A contrasting solution is presented which is built on the assumption that there is no transverse energy exchange in the fluid stream. The 2 solutions are contrasted and compared with experimental data. The resulting evidence shows the new solution to be closer to reality for commonly encountered fin arrangements but the difference in the 2 solutions is small for gas cooled surfaces. They are significantly different if liquids are involved. The results also indicate that caution should be taken when applying these solutions to systems where the longitudinal fins form wedge-shaped flow passageways. (Author)

Hydrodynamics, Hydraulics, and Hydrostatics

PB 150 257 $2.60

Allied Research Associates, Inc., Boston, Mass.
EFFECT OF BODY PERTURBATION ON ADDED MASS - WITH APPLICATION TO NONLINEAR HEAVING OF SHIPS, by Theodore R. Goodman and Theodore P. Sargent. Rept. on Contract Nonr-2343(00). 1 Sep 60, 27p. 11 refs. Document no. ARA-855; AD-241 871.

DESCRIPTORS: *Perturbation theory, *Hydrodynamics, *Ships, Boundary layer, Green's function, Ship hulls, Pressure, Stresses.

A small perturbation theory is presented for determining the effect of a body perturbation on the elements of the hydrodynamic added mass tensor. The cardinal feature of the result is that the contribution to the added masses due to the perturbation is expressed directly in terms of the geometry of the perturbation and a pressure distribution on the unperturbed body. By using the results of this theory approximate evaluation of added masses for many odd shapes can now be readily obtained. The theory has more significance, however, than merely enabling one to calculate the added masses of odd-shaped bodies. In fact, the theory is applicable to any disturbance that may be interpreted in some sense as being equivalent to a geometrical perturbation. An important example of this type of interpretation is the effect of the free surface on the added masses of a

heaving ship. It is well known that in the limit of large frequency the added masses of a surface ship are functions solely of the geometry of the wetted portion of the hull. As the ship oscillates the wetted portion changes with time. This change may be viewed as a geometrical perturbation of the hull shape from its shape at the neutral position. Accounting for the resulting change in added mass gives rise to a force proportional to the square of the velocity. This nonlinear force is determined using the small perturbation theory. Finally, an analogy is exhibited between this force and the cross-flow pressure drag on the front half of a (fore-aft) symmetrical body in a uniform stream. As an example, the force is calculated for a cylindrical hull whose submerged cross-section is a semi-ellipse. (Author)

PB 157 668 $26.00

Office of Naval Research, Washington, D. C.
SYMPOSIUM ON NAVAL HYDRODYNAMICS [NO. 2]. HYDRODYNAMIC NOISE CAVITY FLOW, AUGUST 25-29, 1958. [1958] 592p. 467 refs. ACR-38; AD-250 229.

This report released for sale to the public 8 Sep 61

DESCRIPTORS: *Cavitation noise, *Cavitation, *Symposia, *Hydrodynamics, Aerodynamics, Fluid mechanics, Turbulent flow.

Contents:
Theory and experiment in aerodynamic noise, with a critique or research on jet flows in their relationship to sound, by A. Powell
A theory of turbulence dynamics, by R. H. Kraichnan
Some experimental and theoretical results relating to production of noise by turbulence and the scattering of sound by turbulence or single vortices, by E. A. Müller
Similarity relations in aerodynamic noise measurements, by E. Mollo-Christensen and N. W. Liepmann
Noise production in a turbulent boundary layer by smooth and rough surfaces, by E. Skudrzyk and G. Haddle
Pressure fluctuations on the wall adjacent to a turbulent boundary layer, by M. Harrison
The fluctuating surface pressure created by turbulent boundary layers on hypersonic vehicles, by E. E. Callaghan
Excitation of acoustic resonators by flow, by U. Ingard and L. W. Dean, III
Sound radiation into a closed space from boundary layer turbulence, by I. Dyer
Recent investigations on sonic and ultrasonic cavitation in Göttingen, by E. Meyer
Cavitation noise, by H. M. Fitzpatrick
Pressure waves from collapsing cavities, by T. B. Benjamin
New developments in the theory of supercavitating flows, by M. P. Tulin
Jets, wakes, and cavities, by G. Birkhoff
Cavity flows of viscous liquids in narrow spaces, by Sir G. Taylor and P. G. Saffman
Unsteady supercavitating flows, by T. Y. Wu
The influence of depth of submersion, aspect ratio, and thickness on supercavitating hydrofoils operating at zero cavitation number, by V. E. Johnson, Jr.
Wall effects in cavitating flows, by H. Cohen and R. C. DiPrima
Some aerodynamic cavity flows in flight propulsion systems, by W. G. Cornell
Mechanics of ventilation inception, by K. L. Wadlin
Ventilation of bodies piercing a free surface, by J. M. Wetzel
Air entrainment behind artifically inflated cavities, by I. J. Campbell and D. V. Hilborne
On supercavitating propellers, by H. W. Lerbs
The design and estimated performance of a series of supercavitating propellers, by A. J. Tachmindji and W. B. Morgan
An experimental study of cavitating inducers, by A. J. Acosta
A general linearized theory for cavitating hydrofoils in nonsteady flow, by R. Timman

METALLURGY

BMI-1529 $0.75

Battelle Memorial Inst., Columbus, Ohio
RADIATION STABILITY OF SPHERICAL AND HYDROTHERMAL UO_2 DISPERSED IN TYPE 318 STAINLESS by David G. Freas, James H. Saling and others. Rept. on Contract W-7405-eng-92. 14 July 61, 22p.

TID-13032 $3.60

Case Inst. of Tech., Cleveland, Ohio.
ELASTIC CONSTANTS OF LITHIUM-MAGNESIUM ALLOYS, by Joseph Trivisonno. Technical rept. no. 13 on Contract AT(11-1)-623. Feb 61, 31p.

TID-13196 $1.60

Denver U., Colo.
STUDY OF FACTORS INFLUENCING DUCTILITY OF IRON-ALUMINUM ALLOYS. Rept on Contract AT(11-1)-742. 10 July 61, 6p.

GA-1939 $2.25

General Dynamics Corp., San Diego, Calif.
THERMAL CONDUCTIVITY OF REACTOR MATERIALS, by M. Cutler, H. R. Snodgrass and others. Final rept. on Contract AT(04-3)-167. 30 Jan 61, 99p.

PB 150 763 $6.60

Metals Research Lab., Carnegie Inst. of Tech., Pittsburgh, Pa.
SORPTION IN ALPHA-BRASS, by M. L. Swanson and R. F. Mehl. Technical rept. on Contract Nonr-760(08). 1 Sep 60, 64p. 57 refs. AD-243 883.

DESCRIPTORS: *Brass, Solids, Vapors, Copper, Zinc, *Absorption, Diffusion, Surfaces, *Surface properties, Spectrographic analysis, Test methods, Polarizing filters.

A fundamental experiment was devised to study the effect of surface composition and all aspects of bimetallic sorption. The basic investigations was of the rate of

approach to equilibrium of the surface composition of solid-vapor couples. Since a strain-free and clean surface was essential, electrolytically polished and annealed surfaces were considered appropriate. An optical reflectivity method was chosen which used a polarization spectroscope to analyze and compare elliptically polarized light reflected from the metal surface with that reflected from samples of known composition. The α phase of the Cu-Zn system was selected for study. Results indicated that bulk diffusion is dominant in determining the rate of approach to equilibrium and results in a small value of the condensation coefficient for a clean, imperfect surface. The surface diffusion coefficient of Zn on 20% α-brass was calculated to be 6×10^{-6} sq cm/sec at 396°C. The bulk diffusion coefficients of Zn in α-brass at 360°C were calculated from the experimental surface concentration curves; the values agreed within experimental error with values found by extrapolating high-temperature data, and with anelastic results.

Nonferrous (except light) Metals

ANL-5700, Pt. C. $1.25

Argonne National Lab., Ill.
DIFFUSION IN URANIUM, ITS ALLOYS AND COMPOUNDS, by Steven J. Rothman. Rept. on Contract W-31-109-eng-38. May 61, 56p.

ANL-6080 $1.00

Argonne National Lab., Ill.
SCALE-UP OF HIGH-PURITY URANIUM PRODUCTION, by G. B. O'Keeffe. Rept on Contract W-31-109-eng-38. June 61, 41p.

NYO-6435 $2.60

Columbia U., New York.
A STUDY OF INCLUSIONS IN URANIUM, by George L. Kehl and Eric Mendel. Progress rept. on Contract AT-30-1-155. 25 Nov 59, 26p. CU-1-59-AT-1593-Met.

TID-11919 $1.50

Denver Research Inst., U. of Denver, Colo.
THE DETERMINATION OF THE EQUILIBRIUM PHASE DIAGRAM, ZIRCONIUM-NIOBIUM, by Charles E. Lundin and Ronald H. Cox. Interim rept. no. 1 on Contract AT(11-1)-752. Aug 60, 55p.

Structural Metallurgy and Corrosion

PB 150 423 $3.60

Battelle Memorial Inst., Columbus, Ohio.
MOLYBDENUM AND MOLYBDENUM-BASE ALLOYS. PART 1. HIGH-TEMPERATURE PROPERTIES OF A MOLYBDENUM-3 PER CENT THORIUM ALLOY. PART 2. EVALUATION OF COLUMBIUM-ZIRCONIUM-TITANIUM CLADDING ALLOY, by G. W. P. Rengsorff, G. S. Root and others. Technical rept. on Contract Nonr-1512(00). 9 Sep 60, 36p. 15 refs. AD-242 525.

DESCRIPTORS: *Molybdenum alloys, *Niobium alloys, *Thorium alloys, Zirconium alloys, Titanium alloys, Mechanical properties, Temperature, Oxidation.

High-Temperature Properties of Mo-3% Th Alloys: The properties of arc-cast unalloyed Mo, Mo-3% Th, and Mo-0.5% Ti alloys were compared. Mo-3Th was stronger at 1800° and 2000°F than unalloyed Mo. Mo-0.5Ti was stronger than Mo-3Th at 1800°F, but they were comparable at 2000°F. For extended periods before rupture at 2000°F and for temperatures above 2100°F, Mo-3Th may be stronger than Mo-0.5Ti. Above 2200°F, Mo-3Th resisted softening and recrystallization better than Mo-0.5% Si. Mo-3Th was softer than other Mo alloys in the annealed state and did not work harden as much during fabrication as other alloys. Mo-3Th was much softer than Mo-0.5Ti at temperatures where it has nearly equivalent strength. Evaluation of Cb-Zr-Ti Cladding Alloy: The mechanical properties and oxidation behavior of Cb-55Zr-5Ti were evaluated; Mo-0.5Ti and Cb-33Ta-0.7Zr were selected as suitable cores for cladding experiments. Successful bonds were not made between the base metal (Mo-0.5Ti or Cb-33Ta-0.7Zr) and the cladding (Cb-55Zr-5Ti) at 1650°, 1800°, and 2190°F. Cb-55Zr-5Ti shows little potential for use in cladding applications with stronger and less oxidation-resistant materials. Cb alloys other than Cb-55Zr-5Ti should provide equally good oxidation resistance and better strength.

PB 157 587 $1.10

Massachusetts Inst. of Tech., Cambridge.
[STUDIES OF THE REFRACTORY METALLIC CARBIDES] by John T. Norton. Final rept. on Contract Nonr-1841(24). Nov 60, 10p. 11 refs. AD-247 862.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Carbides, *Refractory materials, Vanadium compounds, Titanium compounds, Niobium compounds, Tantalum compounds, Zirconium compounds, Molybdenum compounds, Tungsten compounds.

A study was made of the solubility relationships of the monocarbides of V, Ti, Cb, Ta, and Zr. The carbides were combined in pairs, and, with the exception of the VC-ZrC system, continuous solid solution series were formed. Solubility relationships were studied for TiC-VC-ZrC, TaC-VC-ZrC, and CbC-VC-ZrC. Isothermal sections of these pseudo ternary systems at 2000 degrees C showed a 2-phase field surrounded by a single-phase field. X-ray diffraction and metallographic studies were made of the ternary Ti-Ta-C system, in particular the isothermal section at 1800 degrees C; note was made of the extent of the cubic single-phase region extending across the diagram. Isothermal sections of Mo-W-C and Mo-Ti-C were studied at 1700 degrees C. WC was sintered with 25 wt-% compositions ranging from pure Cu to pure Ni. The surface energy changed abruptly from the value of pure Cu when the first amount of Ni was added and then remained constant. The solubility varied linearly from zero for pure Cu to about 37 wt-% for pure Ni.

PB 152 402 $3.60

Materials Research Lab., U. of California, Berkeley.
ON THE INTERSECTION MECHANISM OF PLASTIC DEFORMATION IN ALUMINUM SINGLE CRYSTALS, by S. K. Mitra, P. W. Osborne, and J. E. Dorn. Technical rept. no. 9 on Contract Nonr-222(49). 18 Sep 60, 37p. 9 refs. IER series no. 103, issue no. 9; AD-245 144.

DESCRIPTORS: *Aluminum, *Single crystals, Deformation, Hardening, Metallic crystals, Creep, Stresses, Crystal structure, Shear stresses.

A refinement of the Seeger model [Z. Naturforschung, 9a. 758, 856, 870, 1954; Deformation and flow of solids, p. 90. Springer-Verlag, Berlin, 1956] for intersection process is proposed which is in better agreement with experimental observations than the original. CONCLUSIONS: Extensive evidence based on activation energies for deformation and activation volumes strongly support the contention that the rate of deformation of single Al crystals at subatmospheric temperatures is controlled by thermally activated intersection of dislocations. Analyses of the dependence of the flow stress on the activation volume permit the estimation of the force-displacement diagram for the intersection of a dislocation pair. The long range back stress was found to be zero, the entire strain-hardening over Stage II being attributable to short range stress fields encountered upon intersection. The linear strain hardening in Stage II results from the yet unexplained linear increase in the reciprocal of the spacing of forest dislocations with strain. The shape of the creep curves depends on the nature of the force-displacement diagrams for intersection of dislocation pairs. (Author)

PB 157 249 $1.10

Metals Research Lab., Carnegie Inst. of Tech., Pittsburgh, Pa.
DIFFUSION IN THE IRON-CHROMIUM SYSTEM, by H. W. Paxton and T. Kunitake. Rept. on Contract Nonr-760(08). Dec 60, 10p. 26 refs. AD-247 350.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Diffusion, *Iron, *Chromium, Metals, *Iron alloys, *Chromium alloys.

The self-diffusion coefficient of chromium in various alloys in the iron-chromium system has been measured. A variation in D_0 from 10^{-4} for pure chromium to a maximum of 100 near 60 pct Cr appears with a range of activation energy from about 50 to 80 kcal per mol. The general pattern of behavior observed is not consistent with present theories of diffusion by a vacancy mechanism. Suggestions are made for further clarifying experiments. (Author) Pub. in Transactions of the Metallurgical Society of AIME, 218:1003-1009, Dec 60.

ORNL-3078 $5.60

Oak Ridge National Lab., Tenn.
X-RAY AND METALLOGRAPHIC STUDY OF THE NICKEL-RICH ALLOYS OF THE NICKEL-MOLYBDENUM SYSTEM. II, by P. V. Guthrie and E. E. Stansbury. Rept. on Contract W7405-eng-26. 17 July 61, 57p.

NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

TID-13301 $3.60

The Anderson Physical Lab., Champaign, Ill.
PROGRESS REPORT. Technical rept. nos. 15 and 16 on Contract AT(11-1)-544. June 61, 33p.

TID-12897 $4.60

Arizona U., Tucson.
MOVEMENT OF PHOSPHORUS, CALCIUM AND STRONTIUM IN THE SOIL SOLUTION DOWNWARD THROUGH TWO CALCAREOUS SOILS, by Raymond J. Hannapel and Wallace H. Fuller. 14 June 61, 49p.

NAA-SR-M-6155 $1.60

Atomics International, Canoga Park, Calif.
RAPID SURFACE AREA MEASUREMENTS OF URANIUM OXIDE POWDERS BY A MODIFIED "INNES" METHOD, by Tennyson Smith. 17 Feb 61, 18p.

BMI-X-171 $1.60

Battelle Memorial Inst., Columbus, Ohio.
RADIOISOTOPE AND RADIATION APPLICATIONS, ed. by Duane N. Sunderman. Quarterly progress rept. on Contract W7405-eng-92. 31 Oct 60, 19p.

BMI-X-172 $1.60

Battelle Memorial Inst., Columbus, Ohio.
RADIOISOTOPE AND RADIATION APPLICATIONS, ed. by Duane N. Sunderman. Quarterly progress rept. on Contract W7405-eng-92. 18 Jan 61, 19p.

BMI-X-173 $3.60

Battelle Memorial Inst., Columbus, Ohio.
RADIOISOTOPE AND RADIATION APPLICATIONS, ed. by Duane N. Sunderman. Quarterly Progress rept. on Contract W7405-eng-92. 2 May 61, 39p.

TID-13057 $1.10

Carbide and Carbon Chemicals Co., Oak Ridge, Tenn.
RECOVERY OF FLUORINE FROM FEED PLANT VENT GASES, by C. C. Littlefield. 26 May 55, 6p.

GEAP-3487 $0.50

General Electric Co., Pleasanton, Calif.
FAST OXIDE BREEDER PROJECT. II. PRELIMINARY SINTERING STUDIES OF PLUTONIUM-URANIUM DIOXIDE PELLETS, by Jesse M. Cleveland and William C. Cavanaugh. Rept. on Contract AT(04-3)-189. 15 Aug 60, 19p.

HW-SA-2083 $4.60

Hanford Atomic Products Operation, Richland, Wash.
THE DESIGN AND OPERATION OF PUREX PROCESS PULSE COLUMNS, by G. L. Richardson. 17 Feb 61, 50p.

NYO-7830 $14.00

Johns Hopkins U., Baltimore, Md.
RADIOACTIVE WASTE DISPOSAL PRACTICES IN THE ATOMIC ENERGY INDUSTRY. A SURVEY OF THE COSTS, by Arnold B. Joseph. Rept. on Contract AT(30-1)-1477. 31 Dec 55, 202p.

UCRL-6457 $0.50

Lawrence Radiation Lab., U. of California, Livermore.
SOME PROPERTIES OF BERYLLIUM OXIDE, by J. Lillie. Rept. on Contract W-7405-eng-48. 19 May 61, 24p.

ORO-433 $1.10

Mallinckrodt Chemical Works, Nuclear Div., Hematite, Mo.
CHARACTERIZATION OF UO_2 POWDERS. Monthly progress rept. no. 6 on Contract AT(40-1)-2699. Mar 61, 5p.

TID-13055 $0.60

Michigan U., Ann Arbor and Oslo U., (Norway).
TRIURANIUM HEPTAOXIDES: HEAT CAPACITIES AND THERMODYNAMIC PROPERTIES OF a- AND b-U_3O_7 FROM 5 TO 350°K, by Edgar F. Westrum, Jr. and Fredrik Grønvold. [1961] 42p.

TID-3564 $0.50

Office of Technical Information, Atomic Energy Commission, Washington, D. C.
MOLTEN SALTS. SELECTED REFERENCES, comp. by William E. Bost. June 61, 25p.

TID-12604 $5.60

Purdue Research Foundation, Lafayette, Ind.
RESEARCH IN NUCLEAR PHYSICS, by E. Bleuler, O. E. Johnson, and others. Progress rept. No. 11 on Contract AT(11-1)-123. 15 June 61, 54p.

TID-12991 $16.50

Richard B. Wetherill Lab., Purdue U., Lafayette, Ind.
CHEMISTRY OF POLYVALENT METAL HALIDES, by Herbert C. Brown, J. Koelling, and others. Technical progress report on Contract AT(11-1)-170. 1 Mar 60-28 Feb 61, 251p.

NMI-4949 Part II $7.60

Nuclear Metals, Inc., Concord, Mass.
TECHNICAL PAPERS OF THE TWELFTH METALLOGRAPHIC GROUP MEETING HELD AT MALLINCKRODT CHEMICAL WORKS URANIUM DIVISION, ST. LOUIS, MISSOURI, FEBRUARY 26, 27, 1958, comp. by H. P. Roth. 12 May 61, 79p.

DP-578 $0.50

Savannah River, Lab., Aiken, S. C.
COLORIMETRIC DETERMINATION OF URANIUM (IV), by Robert S. Dorsett. Rept. on Contract AT(07-2)-1. May 61, 9p.

ORO-438 $4.60

Southern Research Inst., Birmingham, Ala.
SURFACE TENSION OF FUSED SALTS. Progress rept. on Contract AT(40-1)-2073. 12 Mar 58, 50p.

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Southern Research Inst., Birmingham, Ala.
SURFACE TENSION OF FUSED SALTS. Progress rept. on Contract AT(40-1)-2073. 18 Mar 57, 30p.

YAEC-147 $2.50

Westinghouse Electric Corp., Pittsburgh, Pa.
CORROSION OF SILVER-INDIUM-CADMIUM IN BORATED HIGH TEMPERATURE WATER, by D. D. Whyte and A. Krieg. Rept. on Contract AT(30-3)-222. June 60, 136p.

NYO-2904 $4.60

Westinghouse Research Labs., Pittsburgh, Pa.
ULTRAHIGH VACUUM TECHNIQUES, by M. A. Biondi, R. E. Fox, and others. Annual report on Contract AT (30-1)2176. 30 Apr 61, 47p.

Instruments and Installations

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Atomics International, Canoga Park, Calif.
FLEXIBLE FAST-SLOW PREAMPLIFIER FOR COINCIDENCE EXPERIMENTS, by L. S. Beller. 5 Apr 61, 23p.

WAPD-PWR-S(A)-501 $1.10

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WAPD-PWR-TE-107 TEST EVALUATION OF DLCS 3380101 CALIBRATION OF CORE FLOW INSTRUMENTATION, by James G. Evans. Rept. on Contract AT-11-1-GEN-14. 24 May 61, 8p.

WAPD-PWR-S(A)-518 $1.10

Bettis Atomic Power Lab., Westinghouse Electric Corp., Pittsburgh 30, Pa.
WAPD-PWR-TE-114 TEST EVALUATION OF DLCS 2430110 PERIODIC CALIBRATION OF TEMPERATURE SENSING ELEMENTS, REACTOR PLANT PORTION, by James G. Evans. Rept. on Contract AT-11-1-GEN-14. 29 May, 6p.

HW-SA-2165 $1.60

Hanford Atomic Products Operation, Richland, Wash.
AN ADIABATIC CALORIMETER FOR HIGH PRECISION SOURCE STANDARDIZATION AND DETERMINATION OF W (AIR), by I. T. Myers, W. H. LeBlanc, and others. Rept. on Contract AT (45-1)1350. 1 Mar 61, 16p.

UCRL-9720 $0.50

Lawrence Radiation Lab., U. of California, Berkeley.
A MULTIPLEX PULSE-HEIGHT RECORDER AND ANALYZER, by A. A. Wydler. Rept. on Contract W-7405-eng-48. 26 May 61, 19p.

TID-12856 $3.60

Los Alamos Scientific Lab., U. of California, N. Mex.
SEMICONDUCTOR DETECTOR SYSTEMS (dE/dX AND E) FOR THE DETECTION AND MASS IDENTIFICATION OF PROTONS, DEUTERONS, TRITONS, He^3 AND ALPHA PARTICLES IN THE 10- TO 30-MEV ENERGY REGION, by H. E. Wegner. 6 June 61, 37p.

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Office of Technical Information, Atomic Energy Commission, Washington, D. C.
REACTOR SAFETY. A LITERATURE SEARCH, by Richard J. Smith. July 61, 77p.

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Aerojet-General Nucleonics, San Ramon, Calif.
SPACE POWER SYSTEMS TECHNOLOGY STUDIES. RUBIDIUM AND CESIUM EVALUATION PROGRAM, by Peter F. Young. Rept. no. 1 on Contract AT (04-3)368. 1 Feb-30 Apr 61, 11p.

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Aeroprojects, Inc., West Chester, Pa.
APPLICATIONS OF ULTRASONIC ENERGY. TASK 2: ULTRASONIC METAL AND CERAMIC POWDER PROCESSING. TASK 3: ULTRASONIC INSTRUMENTATION. Progress rept. no. 26 on Contract AT (30-1)1836. Apr 61, 28p.

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APPLICATIONS OF ULTRASONIC ENERGY. ULTRASONIC DISSOLUTION OF ALUMINA AND OF HIGH-FIRED THORIA PELLETS, by William B. Tarpley and Robert S. Winchester. Rept. on Contract AT (30-1)1836. Apr 61, 23p.

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Aeroprojects Inc., West Chester, Pa.
APPLICATIONS OF ULTRASONIC ENERGY TO PYROMETALLURGICAL AND PYROCHEMICAL PROCESSING OF NUCLEAR MATERIALS, by C. D. McKinney, Jr., William B. Tarpley, and R. S. Winchester. Rept. on Contract AT (30-1)1836. Apr 61, 42p.

NYO-9581 $1.60

Aeroprojects Inc., West Chester, Pa.
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EVALUATION OF HELIUM SEAL SELECTED FOR NUCLEAR REACTOR COOLANT COMPRESSORS IN GAS COOLED POWER REACTOR RESEARCH & DEVELOPMENT PROGRAM. Rept. on Contract no. 5918RD-1. Jan 61, 202p.

ACNP-6101 $5.60

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
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PRESSURE DROP EXPERIMENTS OF UPPER AND LOWER DUMMY ASSEMBLIES FOR THE EXPERIMENTAL GAS COOLED REACTOR, by T. J. McDonald and R. M. Higgins. Rept. on Contract AT(10-1)-925. 30 Nov 60, 51p.

TID-13305 $4.60

American Institute of Electrical Engineers, Ithaca, N. Y.
SELECTED OPERATING EXPERIENCE OF COMMISSION POWER REACTORS, by J. O Roberts. 18 June 61, 43p.

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THE DESIGN AND CONSTRUCTION OF THE EBR-II INITIAL FUEL LOADING FACILITY, by James E. Ayer and Arthur B. Shuck. Rept. on Contract W-31-109-eng-38. June 61, 23p.

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NAA-SR-M-5979 $1.60

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NUCLEAR MERCHANT SHIP REACTOR EXTENDED ZERO POWER TESTS BRIDGING EXPERIMENTS, by M. L. Batch, R. M. Ball, and others. Rept. on Contract AT (30-1)2534. May 61, 72p.

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General Electric Co., San Jose, Calif,
ECONOMIC COMPARISON OF CONTROL ROD MATERIALS, by T. J. Pashos, G. D. Ritland, and H. E. Williamson. Rept. on Contract AT(04-3)-189. 25 Feb. 24p.

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General Electric Co., San Jose, Calif.
THE STABILITY OF TWO-PHASE FLOW LOOPS AND RESPONSE TO SHIP'S MOTION, by E. S. Beckjord. Rept. on Contract AT(04-3)189. 26 Sep 60, 47p.

HW-67258 $4.60

Hanford Atomic Products Operation, Richland, Wash.
NPR PROCESS TUBE TO NOZZLE FITTING EVALUATION, by J. H. Fastabend. 1 Dec 60, 43p.

TID-12102 $6.60

Hanford Atomic Products Operation, Richland, Wash.
NUCLEAR MATERIALS CONTROL IN POWER REACTOR OPERATIONS. Rept. on Contract AT(45-1)-1350. May 61, 69p.

TID-12101 $8.10

Hanford Atomic Products Operation, Richland, Wash.
NUCLEAR MATERIALS CONTROL IN REACTOR FUEL FABRICATION. Rept. on Contract AT(45-1)-1350. Apr 61, 85p.

TID-12562 $3.60

Los Alamos Scientific Lab., U. of California, N. Mex.
THE POWDER METALLURGY OF PLUTONIUM FUEL MATERIALS, by A. E. Ogard, W. C. Pritchard and others. [1961] 39p.

MND-M3A-2496-II, Vol. 2 $7.60

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SITE DESCRIPTION AND SAFETY EVALUATION, by W. Haass. Rept. on Contract AT (30-1)2700. June 61, 77p.

TID-13221 $1.10

Michigan U. Coll. of Literature, Science, and the Arts, Ann Arbor.
THE UNIVERSITY OF MICHIGAN 83-INCH CYCLOTRON, by W. C. Parkinson and R. S. Tickle. Rept. on Contract AT(11-1)-921. July 61, 11p. UMRI-03763-4-P.

NDA-2162-3 $1.60

Nuclear Development Corp. of America, White Plains, N. Y., and the Carborundum Co., Niagara Falls, N. Y.
CARBIDE FUEL DEVELOPMENT, by A. Strasser and K. Taylor. Progress rept. on Contract AT(30-1)-2303. 1 June 61, 19p.

NUMEC-P-28 $1.10

Nuclear Materials and Equipment Corp., Apollo, Pa.
DEVELOPMENT OF PLUTONIUM BEARING FUEL MATERIALS. Monthly progress letter for 1-31 May, on Contract AT (30-1)2389. 31 May 61, 6p.

NYO-2797 $1.60

Nuclear Materials and Equipment Corp., Apollo, Pa.
QUARTERLY PROGRESS REPORT ON CONTRACT AT(30-1)-2264 FOR PERIOD ENDING 30 APRIL 59. 18p.

NMI-2095 $2.60

Nuclear Metals, Inc., Concord, Mass.
FUNDAMENTAL AND APPLIED RESEARCH AND DEVELOPMENT IN METALLURGY, by A. R. Kaufman. Rept. on Contract AT (30-1)1565. 19 May 61, 25p.

NMI-2096 $2.60

Nuclear Metals, Inc., Concord, Mass.
FUNDAMENTAL AND APPLIED RESEARCH AND DEVELOPMENT IN METALLURGY, by A. R. Kaufman. Rept. on Contract AT (30-1)1565. 7 June 1961, 21p.

TID-7608 $3.00

Oak Ridge National Lab., Tenn.
PROCEEDINGS OF THE UNIVERSITY REACTOR CONFERENCE. Held at Gatlinburg, Tennessee, August 17-19, 1960. June 61, 198p.

CF-61-3-9, App. $14.00

Oak Ridge National Lab., Tenn.
THORIUM BREEDER REACTOR EVALUATION. Part 1. FUEL YIELD AND FUEL CYCLE COSTS IN FIVE THERMAL BREEDERS. APPENDICES, by L. G. Alexander, W. L. Carter, and others. 24 May 61, 206p.

TID-3556, Rev. 1 $1.25

Office of Technical Information, Atomic Energy Commission, Washington, D. C.
SELECTED REACTORS OR THE POWER REACTOR DEMONSTRATION PROGRAM, by James M. Jacobs. June 61, 51p.

TID-11918 $2.75

Sargent and Lundy, Chicago, Ill.
ENGINEERING EVALUATION STUDIES, HEAVY WATER MODERATED POWER REACTOR PLANTS. Quarterly progress rept. for Oct-Dec 60, on Contract AT(38-1)213. 24 Jan 61, 171p.

UCRL-6397 $5.60

Stanford Research Inst., Menlo Park, Calif.
CLOSE-IN EARTH MOTIONS, PROJECT HOBO, by L. M. Swift and W. M. Wells. Final rept. on Contract AT(043)-115. 28 Mar 61, 56p.

TID-6814 $7.60

Thompson Ramo Wooldridge, Inc., Cleveland, Ohio.
THE SNAP II POWER CONVERSION SYSTEM, by M. A. Keresman. Topical rept. no. 5 on Mercury Pump Design, Contract AT(11-1)-GEN-8. 10 June 60, 79p. Rept. no. ER-4101.

WCAP-4056 $2.60

Westinghouse Electric Corp., Pittsburgh 30, Pa.
CVTR PROJECT: CAROLINAS VIRGINIA NUCLEAR POWER ASSOCIATES, INC., Monthly Progress rept. on Contract AT(30-1)-2289. June 61, 28p.

Nuclear Reactions

NAA-SR-M-6212 $1.60

Atomics International, Canoga Park, Calif.
DATA REDUCTION TABLES FOR REACTIVITY MEASUREMENTS, by L. Beller. 21 Mar 61, 14p.

GEAP-3617 $1.50

General Electric Co., Pleasanton, Calif.
ABSORBER BURN-UP EXPERIMENT INTERIM REPORT, by. John L. Russell, Jr., Morton R. Carrothers, and Walter V. Mosgovoy. Rept. on Contract AT(04-3)-189. 20 Jan 61, 60p.

Radioactivity

PB 157 694 $6.60

Air Force Special Weapons Center, Kirtland AFB, N. Mex.
RESULTS OBTAINED USING AN IBM 704 PROGRAM FOR COMPUTING U235 FISSION-PRODUCT POPULATIONS, ACTIVITIES AND POWERS, by Thomas B. Kerr and Roddy B. Walton. Aug 59, 67p. 10 refs. AFSWC-TN-59-19; AD-229 037.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Uranium, *Radioactive isotopes, Fission product activity, Radioactive decay, Digital computers, Programming.

The theory, flow diagrams, decay chain assignments, and operating instructions for an IBM 704 program for calculating the fission product inventories for U235 fueled reactors are presented. Comparisons of U235 fission product decay power and activity between this program and the Way-Wigner equation for cyclic operation are made for a number of cyclic reactor histories. A graph is presented showing the ratio of the gamma power from each of four arbitrarily chosen energy ranges to the total gamma power as a function of time after 10^{23} fission. The ratio of fission-product beta power to gamma power for several histories is also graphically presented. Gross fission product properties and the individual isotopic activities after 21 cycles are listed. (Author)

TID-13053 $2.60

Brookhaven National Lab., Upton, N.Y.
FISSION-PRODUCT ABSORPTION IN THE INTERMEDIATE ENERGY RANGE OF 0.5 - 100 eV., by G. Srikantiah. 10 Sep 59, 21p.

PB 161 594 $1.50

National Bureau of Standards, Washington, D. C.
AN EXPERIMENTAL STUDY OF BETA DECAY USING THE RADIATIONS FROM ORIENTED NUCLEI, by Dale D. Hoppes. Doctorial thesis. Aug 61, 50p. 57 refs. Technical note no. 93.

DESCRIPTORS: *Beta decay, *Nuclear spins, Nuclear shell models, Cerium, *Forbidden transitions.

The angular distribution of electrons with respect to the nuclear spin direction is shown to furnish information about the relative contribution of the different operators in first-forbidden beta decay. An experimental determination of two coefficients in a Legendre polynomial expansion of this distribution function for a transition in the decay of cerium-141 is made by observing the radiations from both aligned and polarized nuclei. Together with calculations based on reliable shell model assumptions this information allows the determination of the relative contribution of the significant relativistic operator $\underline{a}$. The results $M(\underline{a})/M(\underline{\sigma} \times \underline{r}) = -29.4 \pm 1.5$ is compared with some general estimates of this quantity.

TID-7613(Bks 1&2) $8.00

National Reactor Testing Station, Idaho Falls and Atomic Energy Commission. Div. of Reactor Development, Washington, D. C.
REPORT OF THE SECOND WORKING MEETING ON FIXATION OF RADIOACTIVITY IN STABLE, SOLID MEDIA, IDAHO FALLS, IDAHO, SEPTEMBER 27-29, 1960, comp. and ed. by James M. Morgan, Jr., Donald K. Jamison, and John D. Stevenson. Feb 61, 789p.

TID-13300 $1.60

Notre Dame U., Ind.
COULOMB FIELD EFFECTS ON THE DECAY OF BOUND POLARIZED MUONS, by W. R. Johnson, R. F. O'Connell, and C. J. Mullin. [1961] 20p.

PB 171 956 $3.00

Radiation Effects Information Center, Battelle Memorial Inst., Columbus, Ohio.
THE EFFECT OF NUCLEAR RADIATION ON ELASTOMERIC AND PLASTIC MATERIALS, by N. J. Broadway, M. A. Youtz and others. Rept. on Contract AF 33(616)5171. 31 May 58, 172p. 37 refs. REIC rept. no. 3; AD-149 552.

DESCRIPTORS: *Radiation damage, *Elastomers, *Plastics, Rubber, Radioactivity.

This report is the third of a series summarizing the state of the art on the effects of nuclear radiation on classes of materials, components, and systems of interest to designers and engineers concerned with nuclear-powered weapons systems. This report presents the state of the art of the effects of nuclear radiation on elastomeric and plastic materials from 1947 to the present. A brief description of the mechanism of radiation damage is followed by detailed presentation of data summarizing the radiation effects information on various types of elastomers and plastics. Also, areas in which more research is needed are indicated. This report does not include information on the use of radiation for polymerization or vulcanization unless it has some bearing on effects of radiation on the finished polymer.

PB 171 960 $1.50

Radiation Effects Information Center, Battelle Memorial Inst., Columbus, Ohio.
THE EFFECT OF NUCLEAR RADIATION ON ELASTOMERIC AND PLASTIC MATERIALS, by N. J. Broadway and S. Palinchak. Rept. on Contract AF 33(616)6564, continuation of Contract AF 33(616)5171. 31 May 59, 54p. 49 refs. REIC rept. no. 3, Add; AD-210 759.

DESCRIPTORS: *Radiation damage, *Elastomers, *Plastics, Radioactivity, Rubber.

The report summarizes the radiation-effects information on the various elastomers and plastics for which data have been published during 1958. Radiation polymerization and radiation vulcanization are not included in this report except as such data have some bearing on the effects of radiation on the finished polymer. This addendum report used as a supplement to REIC Report No. 3 is intended to be sufficiently inclusive to make it valuable as a reference guide on the effects which can be anticipated from nuclear radiation on elastomers and plastics. (Author)

PB 171 965 $2.00

Radiation Effects Information Center, Battelle Memorial Inst., Columbus, Ohio.
THE EFFECT OF NUCLEAR RADIATION ON ELECTRONIC COMPONENTS, by D. J. Hamman, W. E. Chapin and others. Rept. on Contract AF 33(616)6564, continuation of Contract AF 33(616)5171. 30 Apr 60, 74p. 91 refs. REIC rept. no. 12; Addendum to REIC rept. no. 8, AD-214 697; AD-238 311.

DESCRIPTORS: *Electronic equipment, *Radiation damage, Radioactivity, *Electron tubes, Resistors, Capacitors, Transformers, Piezoelectric crystals, Electronic relays, Electronic switches, Meters, Electric insulation, Electric connectors.

This report presents information to cover the state of the art of knowledge on the effects of nuclear radiation on basic electronic parts for the past year. It attempts to relate the observed degradation of electrical characteristics of each device to the materials used in the construction of the device. The statements made in the report are not intended to be design oriented, but rather to survey the relative radiation sensitivity of electronic components and to provide a basis for judging the merits of any technical approach for applying electronic circuitry in a radiation environment. The report contains an expanded section on electron tubes and contains information on electronic parts that have not been considered before. (Author)

PB 171 957 $2.00

Radiation Effects Information Center, Battelle Memorial Inst., Columbus, Ohio.
THE EFFECT OF NUCLEAR RADIATION ON LUBRICANTS AND HYDRAULIC FLUIDS, by S. L. Cosgrove. Rept. on Contract AF 33(616)5171. 30 Apr 58, 80p. 50 refs. REIC rept. no. 4; AD-154 432.

DESCRIPTORS: *Radiation damage, *Lubricants, *Hydraulic fluids, Radioactivity, *Hydraulic oils, Lubricant additives, Aircraft, Antioxidants

This report presents the state of the art of the effect of nuclear radiation on aircraft lubricants and hydraulic fluids from 1955 through 1957. A brief review of the mechanism by which organic materials degrade chemically under the influence of nuclear radiation is followed by a discussion of the radiation stability of current aircraft lubricants and hydraulic fluids. In general, military-specification aircraft lubricants and hydraulic fluids show inadequate radiation stability for projected ANP purposes. The incorporation of antirads into these materials does not provide the necessary additional stability. Aromatic compounds, specifically alkyl biphenyls, and substitued aromatic ethers, show the most promise as radiation-resistant base stocks. In most cases their performance properties have yet to be fully evaluated, especially under in-source, or dynamic irradiation, conditions. Lubricants are categorized by function; radiation-resistant lubricant and hydraulic-fluid development programs are reviewed by chemical species rather than by the contracting agency responsible for their development. The appendixes contain selected tabular data showing the effects of radiation on both conventional materials and those developed for projected ANP use. (Author)

PB 171 961 $1.25

Radiation Effects Information Center, Battelle Memorial Inst., Columbus, Ohio.
THE EFFECT OF NUCLEAR RADIATION ON LUBRICANTS AND HYDRAULIC FLUIDS, by S. L. Cosgrove. Rept. on Contract AF 33(616)6564, continuation of Contract AF 33(616)5171. 15 Mar 60, 46p. 35 refs. REIC rept. no. 4, add. 2; AD-237 793.

DESCRIPTORS: *Radiation damage, *Lubricants, *Hydraulic fluids, Radioactivity, *Hydraulic oils, Lubricant additives, Aircraft

This report reviews publications, reports, and other communications received during 1959. Basic radiation studies with pure organic fluids (primarily hydrocarbons) are reviewed, and their significance with respect to lubricant and hydraulic-fluid development is discussed. During the past year, fluid development for airborne lubrication and hydraulics applications has been confined to alkyl aromatic hydrocarbons and aromatic ether formulations. Of these materials, Calresearch 59R-439, based on isopropyl-1, 9-diphenylnonane, exhibits the most promising combination of performance properties and radiation stability. In general, laboratory performance studies with both conventional and experimental radiation-resistant gas turbine lubricants under in-source conditions have confirmed earlier conclusions concerning the radiation stability of these fluids. Results of in-source component and system studies with military-specification fluids indicate that combined environments are generally no more severe than is radiolysis followed by conventional systems testing. Many systems continued to operate satisfactorily in spite of radical changes in fluid properties. No significant grease or dry-film lubricant development studies were reported during the past year. Results of in-source, grease-lubricated-bearing life studies suggest that static (capsule) irradiation exposure, followed by bearing life testing, provides a good estimate of bearing life under combined environments.

PB 171 957-1 $1.50

Radiation Effects Information Center, Battelle Memorial Inst., Columbus, Ohio.
THE EFFECT OF NUCLEAR RADIATION ON LUBRICANTS AND HYDRAULIC FLUIDS (FIRST ADDENDUM), by S. L. Cosgrove. Rept. on Contract AF 33(616)5171. 31 Mar 59, 51p. 42 refs. REIC rept. no. 4 (Addendum); AD-210 760.

DESCRIPTORS: *Radiation damage, *Lubricants, *Hydraulic fluids, Antioxidants, Radioactivity, Aircraft, Lubricant additives, *Hydraulic oils

This report reviews publications, reports and other communications received during 1958. Those basic radiation studies on organic compounds of significance to lubricant and hydraulic fluid development are reviewed, and their significance is discussed. Radiation-resistant gas-turbine-lubricant development during the past year has centered around the expanded study of polyphenyl ethers and alkylated aromatic ethers. Meta-linked polyphenyl ethers (uninhibited) show promise for use in the 0 to 700 F range and at exposures up to 1×10^{11} ergs $g^{-1}(C)$. Alkylated aromatic ethers (containing antioxidants) are somewhat less radiation stable, but show a useful temperature range of approximately -35 to 600 F. Alkylated diphenyl ethers and diaryl alkanes show the most promise for use in conventional hydraulic systems under irradiation conditions. In hydraulic systems which would tolerate high pour points (about 5F) and marginal high-temperature viscosity, unsubstituted polyphenyl ethers could be used to advantage. The combination of radiation-stable fluids and modified soap (terephthalamates) or nonsoap thickeners has resulted in greases of adequate radiation stability for anticipated ANP needs. Likewise, commercially available dry-film lubricants show adequate radiation stability for anticipated ANP applications. (Author)
(See also PB 171 957)

PB 171 962 $1.50

Radiation Effects Information Center, Battelle Memorial Inst., Columbus, Ohio.
THE EFFECT OF NUCLEAR RADIATION ON PROTECTIVE COATINGS, by Ramona A. Mayer, Norman J. Broadway, and Stephen Pallinchak. Rept. on Contract AF 33(616)7375, continuation of Contract AF 33(616)6564. 15 July 60, 58p. 12 refs. REIC rept. no. 13; AD-241 430.

DESCRIPTORS: *Coatings, Radiation damage, Paints, *Organic coatings, *Aircraft finishes.

Coatings generally considered for present and future use in the aviation industry are based on the following materials: phenolics, furanes, alkyds, silicone alkyds, vinyls, nitrocellulose, neoprene, styrene-butadiene, and epoxy. Coatings and paints prepared from all these resins except polyvinyl chloride and nitrocellulose appear to be satisfactory for use after exposure to 8.7×10^{10} ergs $g^{-1}(C)$ (1×10^{9} roentgens). The vinyl and nitrocellulose resins are least resistant to radiation and are only satisfactory to the 10^{10} ergs $g^{-1}(C)$ exposure. Exposure up to 500 F has little effect on a phenolic coating at 8.7×10^{10} ergs $g^{-1}(C)$. Additives such as pigments, plasticizers, and other coating ingredients, as well as the type of surface on which the coating is applied, influence the radiation stability of the coating. Coatings which are highly pigmented are generally more resistant to radiation than similar gloss coatings containing lesser amounts of pigments. Applied coatings, irradiated while they are wet, do not have the stability observed for coatings which have been dried. Studies show that Alkaloy (furane base) and Epon-395 (epoxy base) coatings have good chemical resistance after exposure to approximately 8.7×10^{10} ergs $g^{-1}(C)$ (10^{9} roentgens). Amphesive-801, a modified phenolic, loses its resistance to sodium hydroxide and the organic solvent, hexone (methyl isobutyl ketone), as a result of irradiation. Epon-1001 also loses its resistance to hexone when irradiated. Epon-395 becomes resistant to sulfuric and hydrochloric acid as a result of gamma radiation. (Author)

PB 157 682 $3.60

Radiation Effects Information Center, Battelle Memorial Inst., Columbus, Ohio.
THE EFFECT OF NUCLEAR RADIATION ON RESISTORS AND RESISTOR MATERIALS, by W. E. Chapin. Rept. on [Contract AF 33(616)6564]. 15 Jan 60, 33p. 34 refs. REIC Memo. no. 20; AD-232 159.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Radiation damage, *Resistors, Carbon resistors, Metal films, Phenolic resins, Epoxides, Carbon, Glass, Metals, Air, Materials.

Contents:
Radiation effects on resistor materials
- Phenolic and bakelite
- Epoxide resins
- Ceramics
- Glasses
- Air
- Carbon
- Metals

Radiation effects on resistors
- Carbon composition resistors
- Deposited carbon-film resistors
- Metal-film resistors
- Precision wirewound resistors

Recommendations for resistor selection

PB 171 964 $1.00

Radiation Effects Information Center, Battelle Memorial Inst., Columbus, Ohio.
THE EFFECT OF NUCLEAR RADIATION ON SEMICONDUCTOR DEVICES, by F. J. Reid. Rept. on Contract AF 33(616)6564, continuation of Contract AF 33(616)5171. 30 Apr 60, 35p. 36 refs. REIC rept. no. 10; AD-240 433.

DESCRIPTORS: *Semiconductors, *Radiation damage, Electrical properties, Transistors, Germanium, Silicon, Infrared detectors, Photoelectric cells, Thermoelectricity, Radioactivity.

The current state of the art on the effects of nuclear radiation on semiconductor devices is presented. Information is summarized on permanent radiation effects

observed for various silicon and germanium transistors, diodes, and rectifiers. What information is available is presented on infrared detectors, photovoltaic devices, thermoelectric devices, tunnel diodes, SiC rectifiers, and GaAs Zener reference elements. Information on transient radiation effects is not included. The information reported is intended to be sufficiently inclusive to make it valuable as a guide on effects which can be anticipated from nuclear radiation on electronic circuits utilizing semiconductor devices. (Author)

PB 171 955 $1.25

Radiation Effects Information Center, Battelle Memorial Inst., Columbus, Ohio.
THE EFFECT OF NUCLEAR RADIATION OF SEMICONDUCTOR MATERIALS, by F. J. Reid, J. W. Moody, and R. K. Willardson. Rept. on Contract AF 33(616)5171. 20 Dec 57, 48p. 44 refs. REIC rept. no. 1; AD-147 399.

DESCRIPTORS: *Radiation damage, *Semiconductors, Electrical properties, Germanium, Silicon, Thermoelectricity, Radioactivity.

A literature survey is presented on radiation effects in semiconductor materials. Results indicate that Ge is relatively radiation resistant. For 1 to 30 ohm-cm Ge the minority-carrier lifetime and the conductivity begin to be affected at about 10^{11} fast neutrons/sqcm. Less pure Ge(< 1 ohm-cm) gives greater radiation resistance. Si appears to be less radiation resistant than Ge by as much as a factor of 2.

PB 171 955-1 $1.00

Radiation Effects Information Center, Battelle Memorial Inst., Columbus, Ohio.
THE EFFECT OF NUCLEAR RADIATION ON SEMICONDUCTOR MATERIALS (FIRST ADDENDUM) by L. W. Aukerman. Rept. on Contract AF 33(616)5171. 31 Mar 59, 36p. 116 refs. REIC rept. no. 1 (Addendum); AD-210 758.

DESCRIPTORS: *Radiation damage, *Semiconductors, Germanium, Silicon, Gallium compounds, Arsenides, Indium, Electrical properties, Radioactivity

The literature on the effects of high-energy-radiation semiconductor materials received by the Radiation Effects Information Center during 1958 and 1959 has been reviewed and compared. The materials covered are germanium, silicon, and several compound semiconductors including indium antimonide, gallium antimonide, indium arsenide, aluminum antimonide, and gallium arsenide. All types of irradiation capable of ionizing, producing permanent damage are considered. A rather serious discrepancy between theory and experiment appears to be present in most cases investigated. (Author) (See also PB 171 955)

PB 171 958 $1.25

Radiation Effects Information Center, Battelle Memorial Inst., Columbus, Ohio.
THE EFFECT OF NUCLEAR RADIATION ON STRUCTURAL METALS, by B. C. Allen, A. K. Wolff and others. Rept. on Contract AF 33(616)5171. 31 May 58, rev. 12 Oct 59. 43p. 62 refs. REIC rept. no. 5; AD-157 170.

DESCRIPTORS: *Radiation damage, *Metals, Physical properties, Electrical properties, *Heat resistant alloys, Radioactivity, Fast neutrons.

This report presents the state of the art on the effects of nuclear radiation on structural metals from 1943 through 1957. The general effects of various types of radiation on metals are discussed and the damage mechanisms are outlined. Following this is a topical discussion of the effects of fast neutrons on the physical and electrical properties and corrosion resistance of metals. Tabular data are presented on these effects. Experimental evidence to date indicates that structural metals are quite resistant to nuclear radiation when compared to such things as organic compounds or electronic components. Fast neutrons in integrated flux levels above 10^{19} nvt represent the only reactor radiation that can significantly affect the properties of structural nonfissionable metals. (Author)

PHYSICS

PB 152 267 $1.60

California U., La Jolla.
SPECIFIC HEAT AND SPIN SUSCEPTIBILITY OF DILUTE ALLOYS, by A. Houghton. Technical rept. no. 4 on Contract Nonr-2216(11). [1960] 14p. 10 refs. AD-245 037.

DESCRIPTORS: *Specific heat, Spin, Impurities, *Alloys, *Copper, Theory, Mathematical analysis, Magnetic properties, Metals, Valence.

The effect on the specific heat and spin susceptibility of a metal of valence Z caused by the introduction of an impurity atom with (Z + q) valence electrons is discussed largely by means of the Thomas-Fermi model. In the case of copper, the results of an exact numerical Thomas-Fermi calculation show that the specific heat and spin susceptibility are a factor of 2.5 smaller at q = 4 than a linear theory would predict. It is concluded that the qualitative dependence of the specific heat on q is given by the Thomas-Fermi theory. In an appendix a transport processes. Work thus far on the equation of state has sought to determine correction terms to the perfect gas equation. Incomplete calculations indicate that particle interactions can be accounted for by the virial equation. In addition, approximate relations were found for effects of electric and magnetic fields and radiation. Some calculations were made of the viscosity coefficient in a plasma. Viscosity apparently decreases with increasing ionization.

PB 157 246 $1.60

Naval Supersonic Lab., Mass. Inst. of Tech., Cambridge.
STUDIES OF PLASMA PHYSICS. Quarterly progress rept. no. 1, 1 May-31 July 58, on Contract AF 33(616)5693. [1958] 13p. 5 refs. Technical rept. 337; AD-214 706.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Plasma physics, Gas ionization, Equations of state, Physical properties

The following primary properties characterizing a gaseous plasma are investigated: (a) interrelation of variables of state; (b) energy functions for equilibrium and non-equilibrium conditions; (c) kinetic, electromagnetic, and statistical equations describing the gaseous plasma; (d) the effects of steady or transient motions of the plasma on the plasma properties; and (e) the analysis of check on the theory is made by calculating the specific heat and spin susceptibility using the techniques of many body perturbation theory. (Author)

Electronics

TID-13027 $5.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
FREQUENCY CONVERSION IN A PLASMA, by Jack R. Baird. Technical rept. no. 6 on Contract AT(11-1)-392. 1 May 61, 47p.

UCRL-6467 $0.50

Lawrence Radiation Lab., of California, Livermore.
OSCILLATING VERTICAL MAGNETIC DIPOLE ABOVE A CONDUCTING HALF-SPACE, by James P. Wesley. Rept. on Contract W-7505-eng-48. 2 Apr 61, 16p.

PB 152 591 $12.50

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
QUARTERLY PROGRESS REPORT NO. 40 FOR PERIOD ENDING 30 NOVEMBER 1955, by J. B. Wiesner, G. G. Harvey, and H. J. Zimmermann. [Rept. on Contract DA 36-039-sc-42607]. 15 Jan 56, 171p. 93 refs. AD-89 061.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Electronics, *Physics, Gas discharges, Microwaves, Low temperature research, Microwave spectroscopy, Nuclear magnetic resonance, Hyperfine structure, Stroboscopes, Multipath transmission.

Contents:
Physical electronics; Microwave gaseous discharges; Solid state physics; Low temperature physics; Microwave spectroscopy; Nuclear magnetic resonance and hyperfine structure; Microwave electronics; Atomic beams; Stroboscopic research; Multipath transmission; Statistical communication theory; Processing and transmission of information; Transistor circuits; Semiconductor noise; Irreversible thermodynamics; Speech analysis; Mechanical translation; Sensory replacement; Communications biophysics; Neurophysiology; Nonlinear circuits; Network synthesis.

PB 155 105 $1.10

Tufts U., Medford, Mass.
STUDIES OF A HIGH CURRENT ELECTRICAL DISCHARGE IN AN IONIZED GAS (PART I). ON SOLUTIONS OF THE HEAT EQUATION (PART II), by Lewis S. Combes, James A. Clarkson and others. Final rept. 1 June 60-31 Aug 60 on Contract AF 19(604)1578. 16 Jan 61, 6p. AFCRL-238.

DESCRIPTORS: *Plasma physics, *Electric discharges, Gas ionization, Magnetic pinch, Magnetic fields, Partial differential equations.

TID-12843 $2.60

Westinghouse Research Labs., Pittsburgh, Pa.
REEMISSION OF IONICALLY PUMPED HELIUM BY HELIUM ION BOMBARDMENT, by J. H. Carmichael and P. M. Waters. 7 Feb 61, 23p. Scientific Paper 403FF530-P1.

Molecular Physics and Spectroscopy

PB 152 246 $1.10

Brown, D. A. [Gt. Brit.]
STUDIES IN BONDING IN ORGANO-METALLIC COMPLEXES, by D. A. Brown and H. Sloan. Annual rept. no. 1 on Contract N62558-2381. 10p. 11 refs. AD-243 902.

DESCRIPTORS: *Complex compounds, *Complex ions, Carbonyl radicals, *Metalorganic compounds, Benzene derivatives, Chromium compounds, Chlorides, Synthesis, Decomposition, Bonding, Aniline derivatives, Electrons, Infrared spectroscopy, *Atomic orbitals, Wave analysis, *Quantum mechanics, Molecules, Metals.

The wave functions for the central metal atom in metalorganic complexes and molecular orbitals for these compounds are being studied. The preparation of mono- and polychloro derivatives of benzene chromium tricarbonyl was attempted in order to study the nuclear quadrupole frequencies of the Cl atoms. Chlorobenzene was refluxed with chromium hexacarbonyl in an inert N atmosphere with diethylene glycol dimethyl ether as the solvent; the yield of chlorobenzene chromium tricarbonyl was poor, and decomposition occurred with the formation of chromium trioxide. IR spectrum analysis of the complex with a Perkin-Elmer spectrometer gave a fairly strong band at 704 cm^{-1}; this indicated that there is little change in the C-Cl bond order on the formation of a π complex. Metalorganic complexes with strong E (Dewar notation) substituents were prepared from aniline, N-methylaniline and N, N-dimethylaniline refluxed with chromium hexacarbonyl. The N-H stretching frequency of the aniline chromium tricarbonyl complex was measured, and the results compared to those obtained for aniline; the measurements were 3384 and 3466 cm^{-1} for the complex and 3383 and 3465 cm^{-1} for aniline. Calculation of the pK_a for aniline chromium tricarbonyl gave a value of 2.51, as compared to 4.28 for aniline. It was concluded that ease of addition of a proton to the nitrogen atom is reduced in complex formation, which is in agreement with the simple molecular orbital treatment for the system.

PB 157 285 $3.60

Washington U., Seattle.
A SPECTROPHOTOMETRIC METHOD FOR THE ESTIMATION OF PLANKTON PIGMENTS, by Francis A. Richards and Thomas G. Thompson. Technical rept. no. 5 on Contract N8onr-520/111. Feb 51, 34p. 20 refs. Ref. no. 51-3; ATI-155 309.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Pigments, Spectrophotometers, *Plants, *Aquatic animals, Botany, Chlorophylls.

A semi-micro spectrophotometric method is described for the estimation of chlorophyll a, b, and c, astacin type carotenoids and non-astacin type carotenoids in acetone extracts of plant and animal material. Developed specifically for use in estimating and characterizing plankton populations, the method is highly sensitive and practical for shipboard use. Methods of collecting, preparing and extracting plankton samples, spectrophotometric measurements, computation of results, and errors are discussed. (Author)

Optics

PB 154 022 $1.60

Duntley, S. Q., La Jolla, Calif.
DESIGN OF AN UNDERWATER RADIANCE PHOTOMETER, by John E. Tyler. Rept. no. 3-2 on Contract NObs-72039. Mar 59, 20p. 1 ref.

DESCRIPTORS: *Photometers, Design, *Underwater equipment, Optical equipment, *Light transmission, Sea water, Optics, Underwater photography.

This report describes the design features of a radiance photometer capable of measuring the directional distribution of natural light underwater. This apparatus has evolved gradually over the past nine years in accordance with the needs of investigations of visibility by swimmers, experiments in underwater photography and television, and fundamental research in the principles of hydrologic optics. The continuing development of this type of apparatus is probable because the data it secures is essential for calculations of visibility by swimmers, for the advancement of underwater photography and television, and for the guidance and testing of the steadily growing fundamental understanding of the propagation of light in the sea. (Author)

PB 154 021 $3.60

Duntley, S. Q., La Jolla, Calif.
NOMOGRAPHS FOR CALCULATING VISIBILITY BY SWIMMERS. I. NATURAL LIGHT. Rept. no. 3-1 on Contract NObs-72039. 10 May 58, 37p.

DESCRIPTORS: *Underwater objects, Detection, Visibility, Nomographs, Swimming, Optics, *Sea water.

PB 154 019 $1.10

Duntley, S. Q., La Jolla, Calif.
A SEA SURFACE SIMULATOR. I. THEORETICAL ANALYSIS: SIMULATION OF REFLECTANCE PROPERTIES OF THE SEA SURFACE BY ARRAYS OF ERGODIC CUPS, by Rudolph W. Preisendorfer. Rept. no. 1-1 on Contract NObs-72039. 20 June 58, 10p.

DESCRIPTORS: Simulation, *Oceans, Surface properties, Optics, Reflection, Sea water, Measure theory.

The surface of the sea provides the background against which all floating objects are seen by observers aloft. The luminance of this background depends upon the lighting and upon the sea-state. Measurements of the apparent luminance of the sea from aircraft are possible but expensive. A sea surface simulator has been devised which enables the luminance distribution of the sea surface to be measured under any outdoor lighting conditions without the presence of an ocean and without an airborne photometer. (Author)

PB 154 020 $1.10

Duntley, S. Q., La Jolla, Calif.
A VARIABLE-RANGE SIMULATOR, by Chester J. Silvernail. Rept. no. 1-3 on Contract NObs-72039. 21 June 58, 9p. 2 refs.

DESCRIPTORS: *Telescopes, *Binoculars, Test equipment, Atmospheric refraction, Simulation, *Optical systems.

A variable-range viewer for use with binocular and terrestrial telescopes has been devised to enable small test charts to be viewed in the laboratory under well-controlled, realistically simulated out-door conditions. Object distances from 2 to 20 miles are covered by means of a variable magnification optical system. Contrast attenuation by the atmosphere is introducted automatically as the simulated range is changed. Provision has been made for presetting any desired meteorological range from 2 to 100 miles. (Author)

PB 157 242-2 $15.50

Office of Scientific Research and Development. Div. 16.
VISIBILITY STUDIES AND SOME APPLICATIONS IN THE FIELD OF CAMOUFLAGE. Summary technical rept. vol. 2, Contract OEMsr-1131. 1946, declassified 2 Aug 60. 232p. 56 refs. ATI 12 101.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Camouflage, Effectiveness, Targets, *Visibility, Visual perception, Aircraft, Camouflage paints.

Contents:
Summary of the activities of the NDRC Camouflage Section
Introduction and summary
Visibility of targets
The screening of targets by the atmosphere
Perceptual capacity of the human observer

The visibility of naval targets
Visibility from aircraft
Aircraft camouflage
Camouflage of sea-search aircraft
Antisearchlight camouflage for aircraft

PB 157 692-1 $1.60

Purdue U. Engineering Experiment Station, Lafayette, Ind.
INVESTIGATIONS IN THE ELECTROMAGNETIC SPECTRUM FROM 10 TO 1000 MICRONS, by Burton W. Randolph. Rept. no. 1 on Contract DA 44-009-eng-1408. 1 June 53, 13p. 1 ref. AD-21 485.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Infrared radiation, *Infrared detectors, Phosphors, Alkali metal compounds, Halides.

It is shown that the longest relatively monochromatic far-IR radiation ($\Delta\lambda = 1\,\mu$) which could possibly be detected using the most intense available source and the most sensitive available detector is of 600 μ wave length. Further, it is shown that such a maximum-sensitivity detector would detect heterochromatic radiation from $\lambda = 600\,\mu$ to $\lambda = \infty$ if the shorter wave lengths were sufficiently well filtered out. The steps taken toward setting up initial experiments are discussed; these initial experiments will concern the use of IR-stimulable and quenching-type phosphors as detectors and the use of heated alkali halides as sources of narrow-band IR radiation. (Contractor's abstract)

PB 157 692-2 $1.60

Purdue U. Engineering Experiment Station, Lafayette, Ind.
INVESTIGATIONS IN THE ELECTROMAGNETIC SPECTRUM FROM 10 TO 1000 MICRONS, by Burton W. Randolph. Rept. no. 2 on Contract DA 44-009-eng-1408. 1 Sep 53, 16p. 7 refs. AD-21 484.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Infrared detectors, Phosphors, *Infrared radiation, Stimulation, Instrumentation.

Apparatus set up to measure the decay curves of IR-stimulable and quenching-type phosphors is described. Preliminary results obtained from 6 kinds of phosphors are discussed. Stimulation at different locations in the 1-μ-wave length region was observed in 4 cases. Quenching was not observed, with the same intensity of IR radiation, for phosphors which were reported to be of the quenching type. (Contractor's abstract)

PB 153 986 $1.10

Visibility Lab., U. of California, San Diego.
DETERMINATION OF THE NON-ZERO ASYMPTOTE OF AN EXPONENTIAL DECAY FUNCTION, by W. H. Richardson. Rept. on Contract NObs-72092. 1 July 58, 4p. SIO Ref. 58-36.
Order from LC mi$1.80, ph$1.80 PB 153 986

DESCRIPTORS: *Special functions, Theory, *Light, Attenuation.

PB 153 987 $2.60

Visibility Lab., U. of California, San Diego.
A GENERAL THEORY OF PERTURBED LIGHT FIELDS, WITH APPLICATIONS TO FORWARD SCATTERING EFFECTS IN BEAM TRANSMITTANCE MEASUREMENTS, by R. W. Preisendorfer. Rept. on Contract NObs-72092. 1 May 58, 24p. 1 ref. SIO Ref. 58-37.

DESCRIPTORS: Water, Atmosphere, *Light transmission, *Light, Theory, Attenuation, Measurement, Scattering.

The problem of the measurement of the optical properties of a given medium is complicated by the fact that the act of measurement perturbs the distribution of radiant flux in the immediate vicinity of the measuring process. Consequently, the numbers derived from a measurement process do not faithfully reflect the inherent optical properties of the medium under study, but rather contain along with the information sought both the effects of the presence of the measuring apparatus and its characteristic response to radiant flux. The present note contains a general formulation of the equation of transfer for perturbed radiance field in an arbitrary optical medium. The resultant theory is applied to the problem of the measurement of the volume attenuation function σ (or, equivalently, beam transmittance) in natural waters and the atmosphere. (Author)

PB 153 988 $1.10

Visibility Lab., U. of California, San Diego.
THE K-METHOD OF DETERMINING THE PATH FUNCTION, by R. W. Preisendorfer. Rept. on Contract NObs-72092. 15 May 58, 6p. 4 refs. SIO Ref. 58-39.

DESCRIPTORS: Water, Atmosphere, *Light transmission, *Functions, *Numerical methods and procedures.

PB 153 989 $3.60

Visibility Lab., U. of California, San Diego.
THE PLANETARY HYDROSPHERE PROBLEM. I. GENERAL PRINCIPLES, by R. W. Preisendorfer. Rept. on Contract NObs-72092. 1 July 57, 35p. 6 refs. SIO Ref. 58-40.

DESCRIPTORS: *Sea water, *Light, Penetration, Theory, Mathematical analysis, Atmosphere, Light transmission.

The problem of the penetration of natural light into the sea is analyzed by means of the general principles of radiative transfer theory into a set of boundary problems for the slab geometry. The formulations are intended to be solved by an automatic computer. (Author)

PB 152 266 $1.10

California U., La Jolla.
BAND STRUCTURE OF SEMI-CONDUCTORS, by Walter Kohn. Technical rept. no. 3 on Contract Nonr-2216(11) [1960] 10p. 9 refs. AD-245 036.

DESCRIPTORS: *Semiconductors, Phonons, Crystal structure, Lattices, Energy, Magneto-optic rotation, Tests, Perturbation theory, Electrons, Atomic structure, Solids.

Progress is reported on the band structures of semiconductors. Considered are: clarification of the meaning of energy bands in the presence of electron-electron interaction, proposals for including correlation effects in band calculations, use of effective repulsive potentials, and effects of the electron-lattice interaction. (Author)

TID-13036 $3.60

Case Inst. of Tech., Cleveland, Ohio..
ANGLE OF INCIDENCE MAGNETIC ANISOTROPY IN EVAPORATED NICKEL FILMS, by P. M. Schaible. Technical rept. no. 19 on Contract AT(11-1)-623. May 61, 31p.

TID-13031 $3.60

Case Inst. of Tech., Cleveland, Ohio.
ELECTRONIC BAND STRUCTURE OF CESIUM GOLD, by Van E. Wood. Technical rept. no. 12 on Contract AT(11-1)-623. Feb 61, 40p.

TID-13033 $3.60

Case Inst. of Tech., Cleveland, Ohio.
FIBER TEXTURE AND MAGNETIC ANISOTROPY IN IRON FILMS, by Arthur Yelon. Technical rept. no. 14 on Contract AT (11-1)-623. Mar 61, 39p.

TID-13035 $5.60

Case Inst. of Tech., Cleveland, Ohio.
STRESS AND STRESS ANISOTROPY IN IRON FILMS, by J. D. Finegan and R. W. Hoffman. Technical rept. no. 18 on Contract AT(11-1)-623. May 61, 57p.

TID-13034 $5.65

Case Inst. of Tech., Cleveland, Ohio.
TEMPERATURE DEPENDENCE OF MAGNETIZATION IN THIN NICKEL FILMS, by King H. Rosette. Technical rept. on Contract AT(11-1)-623. May 61, 51p.

PB 150 267 $4.60

Detroit U., Mich.
THE STUDY OF THE PROPERTIES OF SINGLE CdS AND ZnS CRYSTALS, by S. J. Czyzak, H. Payne and others. Technical rept. no. 6, 1 Sep 59-31 Aug 60, on Contract Nonr-1511(01). 1 Sep 60, 47p. 26 refs. AD-242 787.

DESCRIPTORS: *Single crystals, *Cadmium compounds, *Zinc compounds, *Sulfides, Dielectric properties, Refractive index, Electron charge, Infrared detectors, Crystal counters.

Dielectric constant measurements were made on CdS and ZnS single crystals at 25° C and -65° C. Generally, the dielectric constant is relatively independent of the frequency, and the values obtained at both temperatures show no significant difference. The values are essentially the same for measurements taken parallel or perpendicular to the optic axis. The index of refraction measurements was completed up to 1.4μ; work is in progress to extend these measurements to 25μ. The sphalerite $\rightleftarrows$ wurtzite transformation of ZnS is being investigated. Results indicate that the ZnS in the as-grown form has probably a mixed structure, i.e. wurtzite and sphalerite. The application of the statistical model to investigate the properties of CdS and ZnS was not too satisfactory. The work on crystalline copper, which is preliminary to that for the ZnS and CdS, gave large values for the atomic force constants.

PB 157 239 $6.60

Horizons, Inc., Cleveland, Ohio.
FERROELECTRIC DEVICES, by Eugene Wainer. Scientific rept. no. 1, 1 June-31 Aug 55, on Contract AF 33(616)3041, [1955] 65p. 104 refs. AD-72 178.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Ferroelectric materials, Barium compounds, Titanates, *Ferroelectric crystals.

Research is being conducted to develop new and improved ferroelectric materials. Fine particled $BaTiO_3$ was produced by ceramic and chemical techniques. The ceramic techniques, utilizing the principle of elutriation, gave low yields. The chemical techniques are based on the coprecipitation of Ba^{++} and Ti^{++} from H_2O solution at room temperature. This procedure is susceptible to control such that a more uniform product may be expected on a reproducible basis. A variety of compositions based on mixtures of $BaTiO_3$, the niobates and the tantalates of alkali metals, with or without the addition of $PbTiO_3$, exhibited good properties for capacitor purposes, but in some cases, their nonlinearity was as high as 4%. Single crystals of $BaTiO_3$ were produced by growth from a melt. Several hundred crystals were made at one time. The effects of desirable and undesirable impurities were investigated. X-ray techniques were developed for the precise determination of structure, the accurate measurement of axial ratios, and the determination of polar axes.

TID-13160 $6.60

Illinois U., Urbana
PARAMAGNETIC RESONANCE OF F-CENTERS IN ALKALI HALIDES, by W. C. Holton and H. Blum. [1961] 68p.

PB 157 233 $1.60

Pennsylvania State U. Coll. of Chemistry and Physics, University Park.
RESEARCH ON MODERN CRYSTALLOGRAPHY AT THE GROTH INSTITUTE, by Ray Pepinsky. [Progress rept. no. 1] on Contract AF 49(638)416. 1 May 58, 18p. AFOSR Technical operating rept. no. 2; AD-228 881.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Crystals, *Crystal structure, *Documentation, Punched card methods, *Data processing systems.

SCR-416 $3.60

Sandia Corp., Albuquerque, N. Mex.
ELECTRICAL AND OPTICAL EFFECTS OF SHOCK WAVES IN CRYSTALLINE QUARTZ, by F. W. Neilson, W. B. Benedick, and others. June 61, 38p.

PB 157 689 $23.50

Utah U., Salt Lake City.
A SURVEY OF HIGH PRESSURE EFFECTS OF SOLIDS, by K. L. DeVries, G. S. Baker, and P. Gibbs. Rept. for Jan 57-May 59 on Interactions, Imperfections, and Alloy Theory, Contract AF 33(616)5016. Oct 60, 487p. 258 refs. WADC Technical rept. 59-341; AD-247 247.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *High pressure research, *Solids, Bibliography, Pressure, *Metals, Stresses, Test equipment, Tensile properties, Physical properties, Internal friction, Plastic flow, Mechanical properties.

This report contains a summary of all "known" high pressure work done on solids since 1947, with selected reference to work on liquids and gases. The data is presented in the form of 40 tables and more than 500 figures. Some 250 references have been summarized. Descriptions are given of apparatus, procedure, and results. (Author)

Thermodynamics

NAA-SR-M-6328 $1.16

Atomics International, Canoga Park, Calif.
ANALOG COMPUTER SIMULATION OF HEAT TRANSFER TO A MOVING FLUID, by D. E. Fletchall. 19 Apr 61, 32p.

PB 157 688 $1.60

Heat Transfer Lab., Mass. Inst. of Tech., Cambridge.
BURNOUT IN FORCED CONVECTION NUCLEATE BOILING OF WATER, by J. M. Reynolds. Technical rept. no. 10 on Contracts N5ori-07894 and Nonr-1841(39). 1 July 57, 20p. 4 refs. AD-235 387.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Water, *Boiling, Convection, Analysis.

Data are presented for burnout in forced convection nucleate boiling of water at pressures above 500 psia. A dimensionless correlation is devised for the M.I.T. data which is found to be valid for certain recent data reported by Argonne National Laboratory. (Author)

TID-12983 $1.60

Heat Transfer Lab., U. of Minn., Minneapolis.
RESEARCH ON HEAT TRANSFER TO FLUIDS FLOWING THROUGH NON-CIRCULAR CHANNELS, by E. R. G. Eckert and J. L. Novotny. Rept. on Contract AT(11-1)-659. [1961] 10p.

PB 157 286 $3.60

Massachusetts Inst. of Tech., Cambridge.
THE ROLE OF SURFACE CONDITIONS IN NUCLEATE BOILING, by Peter Griffith and John D. Wallis. Technical rept. no. 14 on Contracts N5ori-07894 and Nonr-1848(39). 1 Dec 58, 33p. 6 refs. DSR proj. no. 7-7673; AD-209 392.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Boiling, Theory, Thermodynamics, Stainless steel, *Surface properties.

Nucleation from a single cavity was studied indicating that cavity geometry is important in two ways. The mouth diameter determines the superbeat needed to initiate boiling and its shape determines its stability once boiling has begun. Contact angle is shown to be important in bubble nucleation primarily through its effect on cavity stability. Contact angle measurements made on clean and paraffin coated stainless steel surfaces with water show that the contact angle varies between 20° and 110° for temperatures from 20° to 170°C. On the basis of single cavity nucleation theory, it is proposed to characterize the gross nucleation properties of a given surface for all fluids under all conditions with a single group having the dimensions of length. Finally, it is shown experimentally that this characterization is adequate by boiling water, methanol and ethanol different copper surfaces finished with 3/0 emery, and showing that the number of active centers per unit area is a function of this variable alone.

PB 157 670 $7.60

Princeton U., N. J.
HEAT TRANSFER FROM AN IONIZED GAS TO A GASEOUS COOLANT, by Jerry Grey. Semi-Annual progress rept. no. 1, 1 Feb-31 July 59, on Contract Nonr-1858(31). 31 Aug 59, 75p. 217 refs. Aeronautical Engineering rept. no. 487-a; ARPA Order no. 5-58, Task 7; AD-235 082.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Gas ionization, *Heat transfer, Coolants, Gases, Argon, Helium, Gas diffusion, Test methods, Test facilities, Measurement.

A combined theoretical-experimental program was initiated to study transport properties in the mixing region between a hot, partially ionized gas (argon), and a dissimilar coolant gas (helium). The three regimes to be investigated are turbulent mixing, laminar mixing, and diffusion. A principal objective is to measure the departure from prior determinations caused by extreme temperature gradients, large ionized fractions, high radiation intensities, and nonequilibrium flows. Results for the laminar case indicate that diffusion will be dominant. An experimental configuration utilizing a commercial plasma-jet as the hot-gas source was formulated, and construction of the entire apparatus, including instrumentation for surveying concentration, velocity, and enthalpy profiles in the jet, was essentially completed. Operation of the plasma-jet at about 75 kw has demonstrated that the water-cooled copper probe should experience no heat-transfer difficulties, and has also demonstrated (by testing a plasma torch nozzle to destruction) that an average gas enthalpy of about 15,000 Bui/lb could be obtained. At one atmosphere, this corresponds to an average equilibrium jet temperature of over 27,000°R, with about 35% of the argon ionized. A preliminary literature search of the field was conducted. (Author)

MATT-62 $0.75

Princeton, U., N. J.
A TIME-RESOLVED PROBE METHOD, by Francis F. Chen. Rept. on Contract AT(30-1)-1238. 20 Feb61, 26p.

PB 157 683 $4.60

Stanford U., Calif.
RATE OF SOLIDIFICATION-APPLICATION AND EXTENSION OF THEORY, by David L. Cochran. Technical rept. 24 on Contract N6onr251, T.O. 6. Apr 55, 49p. 4 refs. AD-63 913.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Liquids, *Freezing, *Ice, Theory, Heat transfer, Spheres, Cylindrical bodies.

A summary of the available solutions is presented including the classical, the experimental and the approximate analytical solutions, and the area of applicability of the approximate solutions is shown in terms of the significant dimensionless parameter, the "latent heat to capacity storage ratio." The one-lump-parameter approximation of a freezing slab is considered and is shown to be sufficiently accurate for nearly all problems of technical interest. The extension of the one-lump-parameter approximation to cylinders and spheres is discussed and the necessary modifications are indicated. A brief discussion of two methods of solution for the one-lump-parameter approximation is given. An approximate correction factor is presented which allows an extension of the range of applicability of some of the presently available approximate solutions. (Author)

RESEARCH METHODS, TECHNIQUES AND EQUIPMENT

TID-13043 $6.60

Sandia Corp., Albuquerque, N. Mex.
THE SIXTEENTH MEETING OF THE STANDARDS AND METROLOGY DIVISION OF THE AMERICAN ORDNANCE ASSOCIATION HELD ON FEBRUARY 15 and 16, 1961. 67p.

Photographic Equipment

PB 157 548 $3.60

David Taylor Model Basin, Washington, D. C.
PROPELLER FLASH SYNCHRONIZER AND REVOLUTION COUNTER, TYPE 257A, by Clarence R. Lane. Nov 56, 32p. 9 refs. Rept. 1097.

This report released for sale to the public 8 Sep 61.

DESCRIPTORS: *Marine propellers, *Flash lamps, Instrumentation, *Underwater photography, *Synchronizers, Design, Photographic analysis.

This report describes the design and development of a system for synchronizing the flashing of a high speed stroboscopic flash lamp with a rotating shaft or machine at any selected angular position of the shaft throughout 360 degrees in increments of one degree. The selected angular position of synchronization has an accuracy of better than 0.1 degree. By means of push-buttons, the strobed image viewed may be fixed or caused to slowly rotate in either direction at speeds ranging from one degree per shaft revolution to a maximum of 179 degrees per revolution. The speed of the shaft is also accurately measured and displayed by electronic decimal counters. Shaft speeds up to 1000 RPM may be measured to an accuracy of ± 0.1 revolution per minute. This synchronizing system has been applied to a particular instrumentation problem involving the observation and photographing of ship propellers during full-scale tests of naval vessels.

GAT-Z-5025 $0.50

Goodyear Atomic Corp., Portsmouth, Ohio.
DETERMINATION OF ECCENTRICITY IN X-RAY POWDER CAMERAS, by E. C. Averbukh and S. S. Tolkachev. Rept. on Contract AT(33-2)-1. 21 July 61, 9p.

SOCIAL SCIENCES

PB 156 867 $3.60

Center for Documentation and Communication Research, Western Reserve U., Cleveland, Ohio.
TEST PROGRAM FOR EVALUATING PROCEDURES FOR THE EXPLOITATION OF LITERATURE OF INTEREST TO METALLURGISTS. IV. A COST ANALYSIS OF ABSTRACT PREPARATION AND PROCESSING FOR AN OPERATIONAL SERVICE, by LaVahn Overmyer. Rept. no. 4, 1 Dec 59-31 Dec 60, on National Science Foundation Grant NSF G-10338. [1961] 39p.

DESCRIPTORS: *Metallurgy, *Costs, Coding, *Documentation, *Abstracting, Scientific reports, *Indexes, *Punched card methods.

A description of operations in a Documentation Center and the factors affecting costs of preparing technical abstracts. The cost of each abstract processed was $6.50.

MISCELLANEOUS

PB 171 322 $1.25, $10.00/year

Naval Research Lab., Washington, D. C.
REPORT OF NRL PROGRESS. Sep 61.

DESCRIPTORS: Naval research, Scientific research, Solar rockets, Satellite vehicles, Paints, Submarines, Mass spectroscopy, Tracking, Combat information centers, Lighting systems, Chemistry, Ship fires, Heat transfer, Battery separators, Lead compounds, Oxides, Gases, Fracture (Mechanics), Rocket motors, Insulation, Radiation effects, Thermal stresses, Accelerometers, Plastics, Metallurgy, Ceramic materials, Fatigue (Mechanics), Silicon, Steel, Nuclear power plants, Spinels, Neutron cross sections, Radio, Digital computers, Sound, Hydrostatic pressure, Circular coils, Evaporation, Thin films, Barium compounds.

Contents:
Articles:
Solar Radiation Satellite III, by R. W. Kreplin and J. F. Meekins
Water-Thinned Semigloss Paint for Submarine Interiors, by D. E. Field
Aeronomic Parameters from Mass Spectrometry, by Charles Y. Johnson

Scientific program:
Applications Research: Satellite track computation for display purposes. Computer for satellite position display. Naval data handling system capabilities in position and rate-aided target tracking. Orange wainscot lighting system for use in combat information centers
Chemistry: Field experience in recovering equipment damaged by fire aboard USS CONSTELLATION and equipment subjected to salt spray acceptance test. Heat-transfer studies on some organic fluids in a forced convection loop. Battery plate conversion to lead dioxide and sponge lead from pastes made of the lower lead oxides. An instrument for "on-stream" stripping and analysis of dissolved gases in water
Mechanics: Fracture mechanics concepts developed at NRL for isotropic materials found applicable in unaltered fashion to non-isotropic materials. Fiberglass motor cases in the Polaris program. Apparatus for in-pile electrical measurements and effect of radiation upon strain gage insulation components. Determination of plane strain fracture toughness. Thermal stress of nonmetallic materials. Techniques for the rapid estimation of accelerometer natural frequencies. Shock studies of transparent plastics by high-speed photographic techniques
Metallurgy and Ceramics: High-temperature fatigue in controlled environments. Effects of irradiation on magnetic properties of alloys and ferrites. Electromagnet and sample holder for in-pile measurements o of conductivity and Hall coefficient of silicon. Irradiation studies of various steels in Army nuclear power plant (SMI). Problems in refinement of high vacuum analytical techinques. Protective spinel films on steel: their stabilization to deterioration on room temperature exposure to aqueous media
Nuclear and Atomic Physics: Re-examination of available data on thermal neutron absorption cross sections
Radio: Procedure for selecting interference-free communication channels programmed for a small general purpose electronic digital computer. Electrical breakdown in vacuum tubes
Sound: Experimental facilities for the measurement of acoustic waves in water. Reaction of barium titanite spheres to hydrostatic pressure. Mutual radiation impedance of circular rings on oblate sphroidal baffles
Supporting Techniques: High-purity vacuum evaporatior of silver, nickel, and nichrome thin films

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